

A REVISION OF THE GENUS *PASSEROMYIA*  
RODHAIN & VILLENEUVE (DIPTERA: MUSCIDAE)



BY  
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*Pp.* 339-372; 9 *Text-figures*

BULLETIN OF  
THE BRITISH MUSEUM (NATURAL HISTORY)  
ENTOMOLOGY Vol. 30 No. 7  
LONDON : 1974

THE BULLETIN OF THE BRITISH MUSEUM  
(NATURAL HISTORY), instituted in 1949, is  
issued in five series corresponding to the Departments  
of the Museum, and an Historical series.

*Parts will appear at irregular intervals as they become  
ready. Volumes will contain about three or four  
hundred pages, and will not necessarily be completed  
within one calendar year.*

*In 1965 a separate supplementary series of longer  
papers was instituted, numbered serially for each  
Department.*

*This paper is Vol. 30 No. 7 of the Entomological  
series. The abbreviated titles of periodicals cited follow  
those of the World List of Scientific Periodicals.*

*World List abbreviation  
Bull. Br. Mus. nat. Hist. (Ent.)*

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THE BRITISH MUSEUM (NATURAL HISTORY)

*Issued 28 June, 1974*

*Price £1.80*

# A REVISION OF THE GENUS *PASSEROMYIA* RODHAIN & VILLENEUVE (DIPTERA: MUSCIDAE)

By A. C. PONT

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## SYNOPSIS

The tropical Old World genus *Passeromyia* is revised, and the five species are keyed and described. Knowledge of the larvae and their avian hosts is summarised.

## INTRODUCTION

THE genus *Passeromyia* Rodhain & Villeneuve is a small genus of Muscid flies distributed throughout the Ethiopian and Indo-Australasian regions. Adults are moderately large and robust, measuring up to 9 mm in body-length, and have a very characteristic appearance on account of their densely pruinose bodies and hyaline wings. In the larval stage, the species are associated with birds, either as scavengers in the nests or as parasites of the nestlings.

Despite the fact that there are only five species in the genus, the adult taxonomy and synonymy has been the subject of much confusion, but the study of a large amount of material, including many reared series, combined with study of the available types, has clarified this situation. It was subsequently found that striking differences in the larval feeding habits of the three most widespread species confirmed the species-concepts reached on the basis of the adult taxonomy.

## LOCATION OF MATERIAL STUDIED

The material studied is located in the following museums and institutions (abbreviations given are those used in the text in the lists of material examined).

- AM The Australian Museum, Sydney  
ANIC The Australian National Insect Collection, CSIRO, Canberra  
BMNH British Museum (Natural History), London

\*

BPBM	Bernice P. Bishop Museum, Honolulu
CNC	The Canadian National Collection, Ottawa
HEP	Dr H. E. Paterson's private collection, Nedlands, Western Australia
IAR	Institute of Agricultural Research, Samaru, Nigeria
MCSN	Museo Civico di Storia Naturale, Milan
MNHN	Muséum National d'Histoire Naturelle, Paris
MNHU	Museum für Naturkunde der Humboldt-Universität, Berlin
MRAC	Musée Royal de l'Afrique Centrale, Tervuren
SPHTM	School of Public Health and Tropical Medicine, Sydney
WAM	The Western Australian Museum, Perth
ZM	Zoologisch Museum der Universiteit, Amsterdam

## ACKNOWLEDGEMENTS

I am very grateful to the following colleagues for their assistance in providing me with material, or giving me information on the collections in their care, or for help and advice in other ways:

Dr Z. R. J. Bouček; Dr D. H. Colless; Dr J. Decelle; Mr J. C. Deeming; Dr W. N. Ellis; Mr P. Ferrar; Dr R. J. Gagné; Dr I. C. J. Galbraith; Dr J. L. Gressitt; Mr A. M. Hutson; Dr L. E. Koch; Prof. D. J. Lee; Dr C. Leonardi; Mons. L. Matile; Dr D. K. McAlpine; Dr K. R. Norris; Dr H. E. Paterson; Dr H. Schumann; Dr J. Verbeke; Dr J. R. Vockeroth; and Dr D. M. Wood.

Genus *PASSEROMYIA* Rodhain & Villeneuve

- Passeromyia* Rodhain & Villeneuve, 1915 : 592. Type-species: *Muscina heterochaeta* Villeneuve, 1915, by monotypy.
- Ornithomusca* Townsend, 1916 : 45. Type-species: *Ornithomusca victoria* Townsend, 1916 [= *Morellia indecora* Walker, 1858], by original designation. [Synonymy by Bezzi, 1922 : 31.]
- Passeromyia* Rodhain & Villeneuve; Rodhain & Bequaert, 1916 : 249.
- Passeromyia* Rodhain & Villeneuve; Stein, 1919 : 86-87.
- Passeromyia* Rodhain & Villeneuve; Bezzi, 1922 : 31.
- Passeromyia* Rodhain & Villeneuve; Malloch, 1925 : 46.
- Passeromyia* Rodhain & Villeneuve; Malloch, 1928 : 328.
- Passeromyia* Rodhain & Villeneuve; Townsend, 1935 : 143.
- Ornithomusca* Townsend; Townsend, 1935 : 143.
- Passeromyia* Rodhain & Villeneuve; Townsend, 1937 : 63.
- Ornithomusca* Townsend; Townsend, 1937 : 62.
- Passeromyia* Rodhain & Villeneuve; Séguy, 1937 : 382.
- Passeromyia* Rodhain & Villeneuve; Hardy, 1937 : 28.
- Ornithomusca* Townsend; Hardy, 1937 : 28. [Error for *Ornithomusca* Townsend.]
- Passeromyia* Rodhain & Villeneuve; Emden, 1939 : 52.
- Passeromyia* Rodhain & Villeneuve; Zumpt, 1965 : 39.
- Passeromyia* Rodhain & Villeneuve; Hennig, 1965 : 31.
- Passeromyia* Rodhain & Villeneuve; Emden, 1965 : 194.
- Passeromyia* Rodhain & Villeneuve; Vockeroth, 1972 : 4.

DIAGNOSIS. *Passeromyia* can be recognized by the large truncated lower squama, bare pteropleuron and prosternum, plumose arista, haired hypopleuron below



spiracle (except *veitchi*), upcurved vein 4 (Text-fig. 2), and partially bare wing-membrane (except *veitchi*). The head-shape (Text-fig. 1) is very characteristic, especially the long antennae and broad male frons.

Most specimens can be identified as *Passeromyia* using the African and Oriental keys of Emden (1939; 1965).

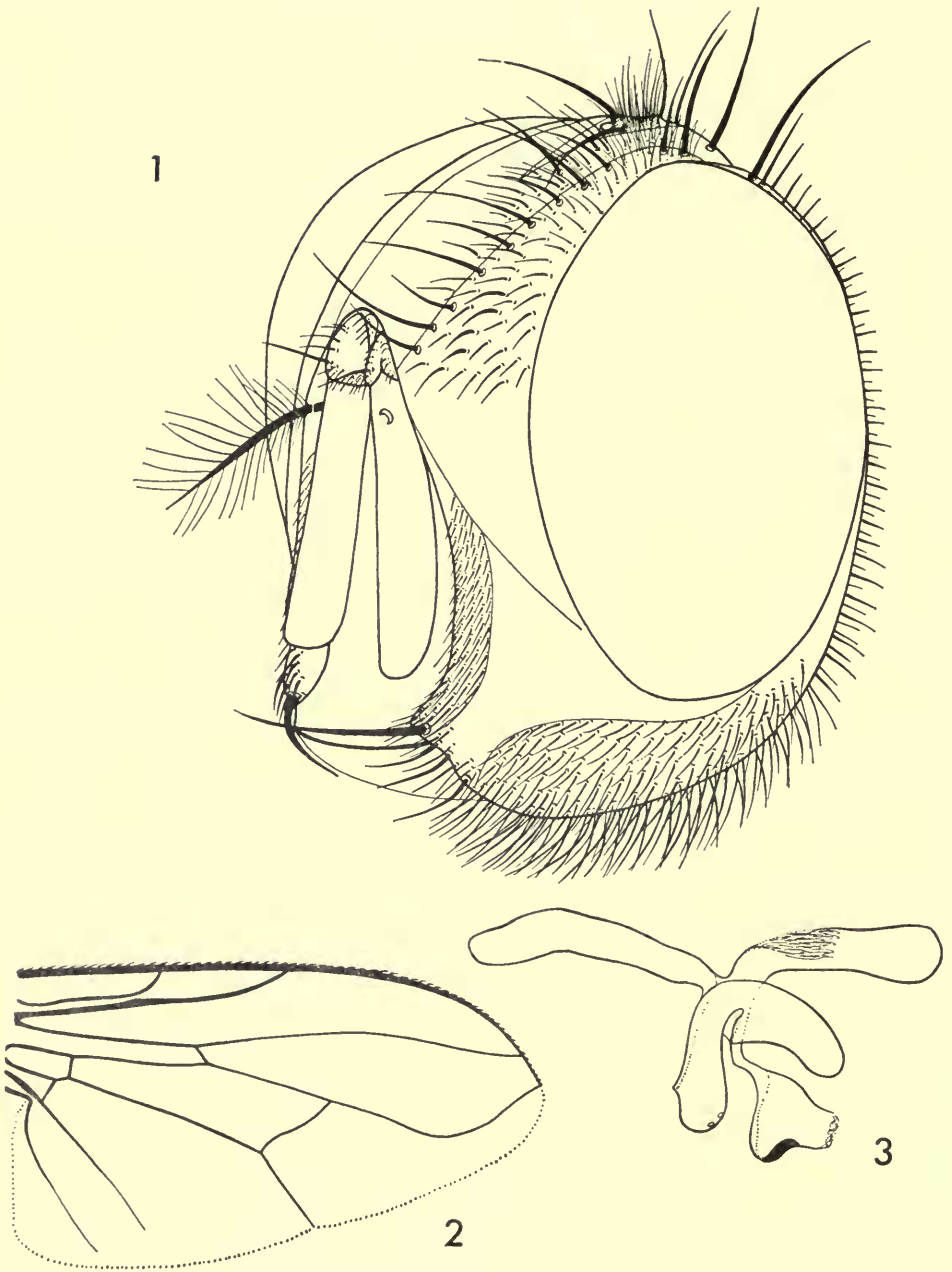
**DESCRIPTION.** Frons dichoptic in both sexes (Text-fig. 1), at middle almost ( $\sigma$ ) to quite ( $\varphi$ ) as broad as the width of an eye at this point. Interfrontal setae present, proclinate *ors* absent. Arista short, shorter than length of 3rd antennal segment; long-plumose, the dorsal plumes longer and sparser than the ventral plumes, and the longest equal to width of 3rd antennal segment. Face and antennae long, face bare. Palpi and proboscis of normal structure, mentum of proboscis shining. *Acr* 2-3 + 2-5 (usually 3-4 *post* pairs). *Dc* 2 + 4. 1-4 *ia* setae. *Pra* present. 3 strong *pa* setae. Post-alar declivity setulose or bare. Supra-squamal ridge, prosternum and propleural depression bare. Prostigmatal seta present. Infra-alar bulla and vallar ridge pilose, pteropleuron bare. *Stpl* 1 + 2. Hypopleuron bare on beret, rarely with a few hairs; bare or setulose below spiracle and on metepisternum. Metathoracic spiracle large, egg-shaped, without setae on margins. Supraspiracular convexity long-pilose. Squamopleuron bare. Scutellar setulae descending on to lateral margins and ventral angle except between the apical setae. Mid femur with 0 *a* and 2-3 *d-p* preapical setae. Mid tibia without *ad* or ventral setae. Hind tibia with a short calcar, not or hardly exceeding tibial depth; *d* and *ad* apical setae moderate; *pv* apical absent. Subcostal sclerite bare. Stem-vein bare. Vein 1 bare. Vein 3 with several setulae in basal part, these sometimes absent on upper wing-surface. Vein 4 conspicuously curved forward towards vein 3 in apical part (Text-fig. 2); cell R5 ending before wing-tip and at apex slightly broader than length of small cross-vein. Lower squama of the *Musca*-type, bare. Sternite 1 setulose. Male aedeagus (Text-fig. 3) with praegonite and postgonite well-developed; epiphallus strong; juxta simple, membranous. Female ovipositor (Text-figs 8-9) long, 4.0-4.5 times length of tergite 5, with the tips of the cerci free-lying; tergite 8 and sternite 8 divided longitudinally, the anterior and posterior halves fused; post-genital plate deeply incised; spiracles absent; 3 spermathecae, spherical, oval or sausage-shaped.

The male genitalia within the genus are very uniform in structure. The only variation is in the male 5th sternite of *heterochaeta* (Text-fig. 4): in this species the lobes are rather broader and the sternite bears longer and denser setulae than in any of the other species (Text-fig. 5).

The female ovipositors within the genus are also very uniform in structure. The cerci point to relationship with the Muscinae + Phaoniinae, although rather reminiscent of the Mydaeinae in that their inner surfaces are for most of their length hollowed out and adpressed to the connective membrane, but their tips project slightly beyond the membrane (Text-figs 8 + 9). Sternite 8 is usually weakly sclerotized, and is frequently difficult to study due to the immaturity of many of the specimens available for study: it is not always clear whether the anterior and posterior halves are fused or not; if not fused then they are closely approximated with only a transverse seam indicating the division. The important point is, however, that the two halves are fully developed and that the sternite is not reduced to a pair of hind-marginal plates. Similarly, tergite 8 has the anterior and posterior halves fused, though sometimes weakly so, and their inner apical edges are sometimes weakly sclerotized; there is never any transverse fusion at this point although the precise limits of the tergite may be difficult to discern.

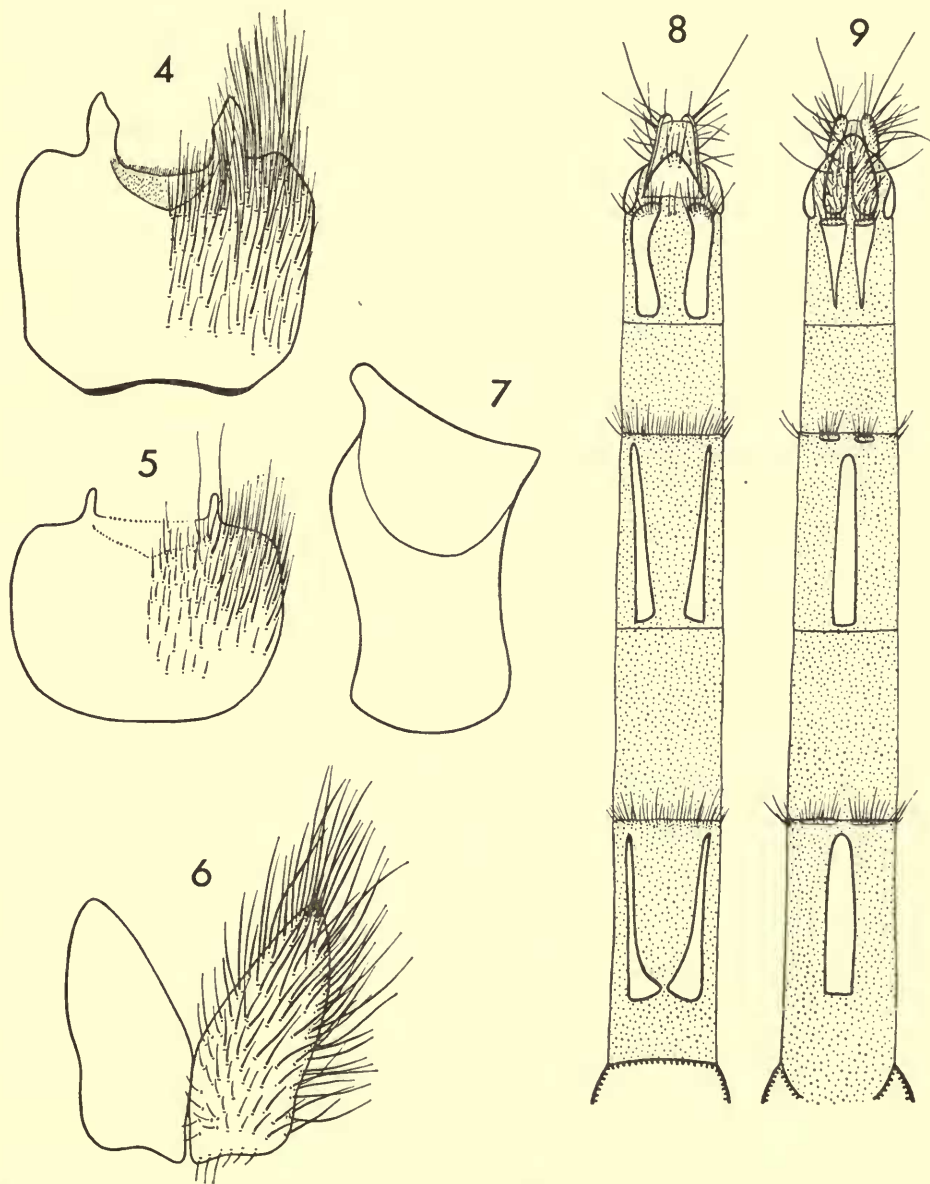
**DISTRIBUTION.** Throughout the Ethiopian and Oriental regions; Australasia and the Western Pacific. Absent from the Malagasy and New Zealand subregions.

**DISCUSSION.** *Passeromyia* and *Ornithomusca* were described at almost the same time from adults reared from larvae infesting nestling birds, *Passeromyia* from Africa and *Ornithomusca* from Australia. In spite of the detailed descriptions given later by Rodhain & Bequaert (1916), Stein (1919) was unable to recognise *Passerom-*



FIGS 1-3. 1, *Passeromyia steini* Pont, male head in fronto-lateral view, frontal setae and arista shown on one side only. 2, *P. heterochaeta* (Villeneuve), wing. 3, *P. heterochaeta*, male aedeagus in lateral view (S. Africa).

*myia heterochaeta* Villeneuve and did not include it in his key to genera or in his catalogue of world species. So far as the other species in the genus are concerned, Stein (1919) placed *longicornis* Stein in *Muscina* Robineau-Desvoidy, *longicornis*



FIGS 4-9. Genitalia of *Passeromyia*. 4, *heterochaeta* (Villeneuve), male 5th sternite (S. Africa). 5, *indecora* (Walker), male 5th sternite (Australia). 6, *indecora*, male cercal plate (Australia). 7, *heterochaeta*, male surstylus (S. Africa). 8, 9, *heterochaeta*, female ovipositor (India): 8, dorsal view; 9, ventral view.

Macquart remained unplaced, *indecora* Walker was placed in *Morellia* Robineau-Desvoidy, and *victoria* Townsend was omitted altogether.

Bezzi (1922) was the first to recognize the kinship of these taxa. He synonymised *Ornithomusca* with *Passeromyia*, gave a key to the two species he recognized, *longicornis* Macquart (= *victoria* Townsend) and *heterochaeta* Villeneuve (= *longicornis* Stein), and gave notes on the distribution and hosts. Since that time, one new species from Fiji has been described into the genus (Bezzi, 1928) and the Australian *indecora* has been transferred to *Passeromyia* from *Morellia* (Emden, 1965), and most authors have followed Bezzi's arrangement (Séguy, 1937; Zumpt, 1965).

There has been considerable confusion over the specific synonymies in this genus, which has been aggravated by the homonymy of *longicornis* Stein with *longicornis* Macquart together with doubts as to whether they were in fact congeneric. The taxonomy of the Australian species has never been worked out, although it has been recognized that several species might occur there.

*Cyrtonevra analis* Macquart, 1851, has sometimes been associated with Australian species of *Passeromyia*, but I have previously shown that this is a Neotropical species of *Graphomya* Robineau-Desvoidy (Pont, 1967: 182).

*Cyrtonevra pruinosa* Wulp, 1880, almost certainly belongs to *Passeromyia*, but the types are lost (Pont, 1970a: 100) and I cannot identify it with any of the described species.

SYSTEMATIC POSITION. Opinions on the systematic position have varied. The genus has usually been placed in the Muscinae (Malloch, 1925; 1928; Séguy, 1937; Hardy, 1937; Emden, 1939), because of the forward curvature of vein 4 and the truncated lower squama. Townsend (1935; 1937), with characteristic vigour, defended the view that *Passeromyia* and *Ornithomusca* were distinct genera, and placed them in a tribe Hemichlorini in which were also included *Hemichlora* Wulp, *Ochromusca* Malloch and *Synthesiomysia* Brauer & Bergenstamm. Recent work (Emden, 1965; Hennig, 1965) has placed *Passeromyia* close to Old World genera such as *Muscina* Robineau-Desvoidy, *Synthesiomysia* Brauer & Bergenstamm, *Calliphorooides* Malloch, *Fraserella* Steyskal, *Phaonina* Emden and *Phaonidia* Emden. In Emden's system, this unit is included in the tribe Phaoniini of the subfamily Phaoniinae. In Hennig's system, this unit is provisionally included in the tribe Hydrotaeini of the subfamily Muscinae, though Hennig stresses that his Hydrotaeini is paraphyletic. It is still not certain where this group of genera should be placed, and I deliberately excluded them from my recent revision of Australian Muscinae (Pont, 1973). Whilst the male aedeagus places the genus in Hennig's group Muscinae + Phaoniinae, the female ovipositor supports assignment in the Muscinae whilst the absence of proclinate *ors* on the female frons indicates the Phaoniinae. Vockeroth (1972) has included the genus in the Muscinae.

In some respects *Passeromyia* resembles the tropical American genus *Neomusca* Malloch: larvae of both genera parasitize nestling birds and form cocoons, and the adults have a certain similarity in general appearance. The ovipositors also show a close similarity (compare Text-figs 8, 9 with Hennig, 1965: figs 48, 49), especially in the structure of the cerci and sternite 8. *Neomusca*, however, has a setulose



pteropleuron and is placed in the subfamily Cyrtoneurinae (Pont, 1972), but this is another obviously paraphyletic group and Hennig (1965) considered that *Neomusca* might be related to the Hydrotaeini despite the setulose pteropleuron.

**BIOLOGY AND REVIEW OF THE LITERATURE.** So far as is known, the larvae live in birds' nests where they develop as scavengers or as obligatory parasites of the nestlings: the biology of three species, *heterochaeta*, *indecora* and *steini*, is known; one host is known for *longicornis*, which may have the same larval habits as *indecora* since it is taxonomically so close; *veitchi* is unknown. Ledger (1969), writing of the African species *heterochaeta* which is an ectoparasitic blood-sucker on nestlings, thought that the ancestral larvae lived as scavengers in the nest débris and later became facultative parasites of the nestlings and eventually obligatory parasites. The saprophagous origin in *heterochaeta* is shown by the fact that if a bird dies the larvae may continue feeding on the carcass or may penetrate into the abdomen (Patton, 1920). Further confirmation was given by Hindwood (1947), who was able to distinguish two different species in Australia: one species (*steini*) is a free-living scavenger in the nest, feeding solely on excreta, food remnants and dead nestlings but never attacking living birds; the second species (*indecora*) is an obligatory subcutaneous parasite of living nestlings, feeding on blood, though if the host dies it will continue to feed in the carcass until ready to pupate. All three stages in the development of this feeding-habit are represented in the genus, and it is interesting that the endemic Australian species *indecora* has the most specialized habit (endoparasitism), whilst the widespread Indo-Australasian *steini* has the most primitive habit (as a scavenger).

Hosts tend to be birds forming compact and well-lined nests, and pupation takes place in the nest-lining, in the feather-lining or beneath it in the grass-lining. With loose nests, larvae pupate beneath them or in the ground. The larva forms a cocoon prior to pupation. Adults feed on rotting fruit, sap and resin, coccid exudate, and excrements, and are frequently found indoors.

A considerable amount of work has been done on the biology and host-range of *heterochaeta* in Africa, and since it is the only African representative of the genus this work can be accepted without further discussion and it is noted in the text below under *heterochaeta* (p. 354). In Australia, however, there are three species that have only been partially and rarely separated in the past, *longicornis*, *indecora* and *steini*, and consequently much of the literature which refers to *longicornis* (Macquart), as the oldest name in the genus, frequently covers mixed series. *P. longicornis* is in fact confined to Tasmania: the records of this species refer to *indecora* or *steini*, and it is thus necessary to review the Australian literature critically in the light of present taxonomic knowledge. The literature was partially and uncritically reviewed by Chisholm (1952) and Owen (1954). Hicks (1959; 1962) has given a bibliography, but this is not complete.

The first Australian host-record is that of Townsend (1916), who described his *Ornithomusca victoria* from *Pardalotus* sp. Shortly after this, Gilbert (1919) recorded a species as a subcutaneous parasite of birds, without naming it, giving an account of the life-history and listing as hosts *Menura superba*, *Meliornis sericea* [= *Phyli-*

*donyris niger*], *M. novaehollandiae* and *Gliciphila fulvifrons* [= *melanops*]. In a later paper Gilbert (1923) named the parasite as *longicornis* Macquart. I have not been able to trace Gilbert's material, but an undated specimen from a nestling of *Gliciphila melanops* is *indecora* Walker and the endoparasitic habit described by Gilbert indicates this species. In the same year as Gilbert, Harvey & Harvey (1919) reported finding parasitic larvae resembling blowflies in nestlings of *Anthus australis* [= *novaeseelandiae*] but none of this material has been traced. Again, it seems probable that *indecora* is the species in question. Cleland (1922), in an account of Australian bird parasites, quotes these larval infestations recorded by Gilbert and the Harveys. Bezzi (1922) recorded a specimen of *longicornis* Macquart reared from *Meliornis* [= *Phylidonyris*] *novaehollandiae*, but this specimen is not now in his collection and the record cannot be checked.

The most extensive account is by Hindwood (1930), whose material was identified as *longicornis* Macquart by Séguy. He described various cases of the infestation of nestlings, all in the Sydney area of New South Wales (Doonside, Middle Harbour, Greenwich and Marley National Park), and gave an account of the life-history together with some figures of infestations in nestlings and of the immature stages. In addition to the four birds in Gilbert's (1919) list, Hindwood recorded as hosts *Carduelis carduelis*, *Anthochaera chrysoptera*, *Pachycephala rufiventris* and *Rhipidura leucophrys*. I have not been able to trace any of this material, but material reared by Hindwood from several species of bird in New South Wales between 1931 and 1950 belongs to *indecora*, except for one series from *Dacelo gigas* which is *steini* (see below).

Hardy (1937) reared a species from nests of *Myzantha garrula* [= *Manorina melanocephala*], which he identified as *longicornis* Macquart, and he recorded the species from Queensland to Victoria and also recorded from its pupae Hymenopterous parasites of the genera *Mormoniella* Ashmead (Pteromalidae), *Paraspilomicrus* Johnston & Tieg (Diapriidae) and *Tachinaeaphagus* Ashmead (Encyrtidae), all of which are normally blowfly parasites. I have not located any of Hardy's material, and it is not clear which species he had before him.

Elliot (1938) recorded *longicornis* from a nest of *Acanthiza uropygialis* in the Moonie River district, where larvae were found in the lining alongside a dead nestling, and Gilbert (1939) recorded the same species from larvae infesting a nestling of *Hylacola pyrrhopygia* in New South Wales. I have seen both sets of material, and all the specimens are *indecora* Walker.

The first account of larvae of what was almost certainly *Passeromyia* living as scavengers is given by Ward (1938), who published a curious report of the feeding-cycle of nestlings of the Bee-Eater [*Merops ornatus*]: he stated that the adults and nestlings defaecate in the nest which is thus able to support an enormous number of scavenging maggots which in their turn generate enough heat to warm the nestlings and, on emerging as adult flies, provide food for the nestlings. This idea was refuted by C. E. B. [ryant] (1939), but it seems probable that the scavenger larvae observed by Ward were in fact *steini*. Roberts (1940) published a detailed account of unnamed Muscid larvae that he observed at Cranbourne, Victoria, in the nest of an Eastern Rosella (*Platycercus eximius*). These larvae were free-living and fed

voraciously on excrement and dead nestlings, but did not attack the living birds. Roberts wrote that he hoped to rear the species to establish its identity, and I have seen this reared material which proves to be *steini*.

Hindwood (1947), in a very interesting account, described the habits of larvae that he found living as scavengers in the nest of a Laughing Jackass (*Dacelo gigas*) at Lane Cove, New South Wales. He found that the larvae fed only on food remains and excreta in the nest, though they also fed on raw meat in the laboratory, and he recorded details of the life-history, adult habits, and parasites. His material was studied by K. C. McKeown of the Australian Museum, who found that it could not be *longicornis* Macquart, a species with densely haired eyes. Hindwood therefore distinguished two Australian nest species: 'longicornis' with hairy eyes (in fact *indecora*), larvae true subcutaneous parasites in living birds though continuing to feed until pupation if the host dies; and 'new species' with bare eyes (in fact *steini*), larvae free-living scavengers. This distinction appears to hold good for larvae and adults, and I have seen some of Hindwood's material from *Dacelo gigas* and can confirm that it is *steini*.

Hindwood (op. cit.) also recorded the species with hairy eyes from the Leaden Flycatcher (*Myiagra rubecula*), the nestling having been killed by the larvae, and I have seen this material which is *indecora*. He recorded the species with bare eyes from *Gymnorhina tibicen*, reared by Elliot, which material I have not seen but which must be *steini*, and also stated that Roberts' material from *Platycercus eximius* had bare eyes.

In two later papers, Hindwood recorded *longicornis* from the nest of the Kookaburra (1951a), as host of a Clerid beetle parasite, and from the nest of the Eastern Rosella (1951b). Since he had previously (Hindwood, 1947) recorded this beetle from his 'bare-eyed' *Passeromyia* in the Kookaburra's nest, this record must refer to *steini* and not to *indecora* (= *longicornis* Macquart sensu Hindwood, 1947). The same is probably the case with the flies from the Eastern Rosella nest, which I have not seen.

More recently, Bourke (1957) has recorded an unnamed species of *Passeromyia* from nests of *Hylochelidon* [= *Petrochelidon*] *ariel* near Gilgandra in New South Wales. I have seen his material which consists mainly of *indecora*, with some *steini*. Further Bourke material, reared from nests of *Merops ornatus*, belongs to *steini*.

Zumpt (1965) has summarized some of these records under the name of *longicornis* Macquart, giving notes on the morphology of the adult, mature larva and pupa, and accounts of the biology, hosts and pathogenesis.

A full check-list of the known hosts of *Passeromyia* is given at the end of this paper.

KEY TO THE SPECIES OF *PASSEROMYIA*

- 1 Post-alar declivity bare. Eyes bare or sparsely haired. Abdomen without any trace of a shifting tessellated pattern. 1-2 *ia* setae. Fore tibia without *p* setae (unknown for *veitchi*) . . . . . 2

\*\*



- Post-alar declivity with a tuft of setulae. Eyes densely haired. Abdomen with at least weak indications of a tessellated pattern. 2-3 *ia* setae. Fore tibia with 1 or more  $\bar{p}$  setae.  
Hypopleuron always haired below spiracle; ♂: sternite 2 with normal comparatively strong setae . . . . . 3
- 2 2 *ia* setae. Wing-membrane quite extensively devoid of microtrichia on basal part, for example the discal cell bare in basal half or less. Hypopleuron haired below spiracle and bare on metepisternum. Abdomen with dense blue dust. Mesonotum with ash-grey to bluish dust and with very weak vittae. Halteres brown to dark brown, knob black. Palpi yellow or black. ♂: sternite 2 covered entirely with short fine dense setae . . . . . *steini* (p. 354)
- 1 *ia* seta. Wing-membrane entirely covered with microtrichia, without any bare patches. Hypopleuron bare below spiracle and haired on metepisternum. Abdomen with very thin blue dust. Mesonotum with brownish grey to golden grey dust and with conspicuous vittae. Halteres yellow, the knob orange. Palpi black. ♂: unknown. . . . . *veitchi* (p. 365)
- 3 Epaulet dark brown. Squamae dark, at least margins of upper and lower ones dark brown. Parafrontalia and parafacialia dark brown pruinose. Scutellum entirely dark  
Palpi black. 2 *ia* setae . . . . . *longicornis* (p. 363)
- Epaulet orange. Squamae pale, at most margin of upper one partly brown. Parafrontalia and parafacialia lighter pruinose, varying from brown through golden to silvery white. Scutellum yellow at tip . . . . . 4
- 4 Abdomen grey dusted, with a conspicuous shifting tessellated pattern. Mesonotum with grey to yellowish grey dust and with conspicuous vittae. 3rd antennal segment shorter, 4 times length of 2nd segment . . . . . *heterochaeta* (p. 350)  
Abdomen densely blue dusted, with at most weak indications of a tessellated pattern. Mesonotum with dense ash-grey or blue-grey dust and very weak vittae. 3rd antennal segment longer, 5 times length of 2nd segment . . . . . *indecora* (p. 358)

### *Passeromyia heterochaeta* (Villeneuve)

(Text-figs 2-4, 7-9)

Muscinae sp. Rodhain, 1914 : 213.

Muscinae sp. Roubaud, 1915 : 96.

*Muscina heterochaeta* Villeneuve, 1915 : 225. Lectotype ♀, ZAMBIA (BMNH), designated by Emden (1965 : 196) [examined].

*Passeromyia heterochaeta* (Villeneuve); Rodhain & Villeneuve, 1915 : 592.

*Passeromyia heterochaeta* (Villeneuve); Rodhain & Bequaert, 1916 : 248-260, figs 1-6.

*Passeromyia heterochaeta* (Villeneuve); Roubaud & Sacqghem, 1916 : 765.

*Passeromyia heterochaeta* (Villeneuve); Roubaud, 1917 : 423.

*Passeromyia heterochaeta* (Villeneuve); Keilin, 1917 : 438.

*Passeromyia heterochaeta* (Villeneuve); Rodhain, 1919 : 499-510, figs 1, 2.

*Passeromyia heterochaeta* (Villeneuve); Stein, 1919 : 86-87.

*Passeromyia heterochaeta* (Villeneuve); Patton, 1920 : 30-31, pl. 5.

*Passeromyia heterochaeta* (Villeneuve); Patel in Fletcher, 1920 : 101.

*Passeromyia heterochaeta* (Villeneuve); Bezzi, 1922 : 31.

*Passeromyia heterochaeta* (Villeneuve); Malloch, 1928 : 328.

[*Passeromyia longicornis* (Stein); Malloch, 1928 : 328, in part. Misidentification.]

*Passeromyia heterochaeta* (Villeneuve); Senior-White, 1930 : 67.

*Passeromyia heterochaeta* (Villeneuve); Cuthbertson, 1932 : 3.

*Passeromyia heterochaeta* (Villeneuve); Cuthbertson, 1935 : 16, pl. 1, fig. 4, pl. 4, fig. 14.



- Passeromyia heterochaeta* (Villeneuve); Townsend, 1935 : 143.  
*Passeromyia heterochaeta* (Villeneuve); Townsend, 1937 : 63.  
*Passeromyia heterochaeta* (Villeneuve); Séguy, 1937 : 383.  
*Passeromyia heterochaeta* (Villeneuve); Cuthbertson, 1939 : 142, pl. 1, figs 5-7, pl. 2, figs 22, 23.  
*Passeromyia heterochaeta* (Villeneuve); Hennig, 1941 : 215-216.  
*Passeromyia heterochaeta* (Villeneuve); Séguy, 1946 : 125-126.  
*Passeromyia heterochaeta* (Villeneuve); Taylor, 1949 : 171.  
*Passeromyia heterochaeta* (Villeneuve); Séguy, 1950 : 349, 351.  
*Passeromyia heterochaeta* (Villeneuve); Séguy, 1955 : 133, 136.  
*Passeromyia heterochaeta* (Villeneuve); Hicks, 1959 : 218.  
*Passeromyia heterochaeta* (Villeneuve); Hicks, 1962 : 256.  
*Passeromyia heterochaeta* (Villeneuve); Zumpt, 1965 : 39-40, figs 41-44.  
*Passeromyia heterochaeta* (Villeneuve); Emden, 1965 : 195, figs 8j, 8k, 1of, 11l, 53.  
*Passeromyia heterochaeta* (Villeneuve); Hennig, 1965 : fig. 11.  
*Passeromyia heterochaeta* (Villeneuve); Haeselbarth, Segermann & Zumpt, 1966 : 38, fig. 28.  
*Passeromyia heterochaeta* (Villeneuve); Ledger, 1969 : 28-30, figs 1-3.

NOTE ON TYPE-MATERIAL. Villeneuve described this species from 4 ♀, and Emden (1965) designated the syntype in BMNH as lectotype. I have seen, and have labelled as paralectotypes, the syntype from Kam-si in MNHN and the syntype from Elisabethville in MRAC. The syntype from Mombasa Island has not been traced, in BMNH, MNHN, MRAC, Villeneuve's collection (Brussels) or Mesnil's collection (CNC).

NOTES ON SYNONYMY. *P. heterochaeta* was synonymized with *longicornis* (Macquart) by Malloch (1925), followed by Hardy (1937), but was reinstated as a valid species with *longicornis* (Stein) as a synonym by Malloch himself (1928), followed by Séguy (1937).

DIAGNOSIS. *P. heterochaeta* can be distinguished from the other species of the genus by the conspicuous shifting pruinose pattern on the abdomen. It has a well-marked pattern of vittae on the mesonotum, and both abdomen and mesonotum are strikingly ash-grey dusted.

The male 5th sternite (Text-fig. 4) differs from that of the other species (e.g. *indecora*, Text-fig. 5) by the rather thicker apical lobes and the much longer setae.

This is the only African species of the genus, and does not occur in Australia.

DESCRIPTION. *Head.* Eyes with moderately long dense hairs which are equal to only one-third width of 3rd antennal segment in male, shorter and sparser in female; eye-facets of uniform width. Ocellar setae moderate. *Vie* strong, slightly weaker than *vii* and twice as long as the adjacent post-ocular setulae. Parafrontalia, parafacialia, face, genae and most of occipital dilation yellowish grey pruinose; occiput with a light grey pruinose band along posterior eye-margin from vertex down on to occipital dilation. Interfrontalia reddish orange in ground-colour. Parafrontalia quite broad, at middle of frons a parafrontale slightly less than (♂) or equal to (♀) width of 3rd antennal segment and one-quarter to one-third width of interfrontalia at this point. *Ori* strong and inclinate, 6-8 pairs with a few fine interstitials, on lower three-quarters of frons, the upper ones rather more proclinate; parafrontalia otherwise with numerous dense fine hairs and setulae from vertex to lunula. Interfrontalia on upper half with 1-2 pairs of inclinate setae, and many setulae and hairs covering much of interfrontal surface here. First and 2nd antennal segments reddish, rather infuscate on disc; 3rd segment reddish at base, otherwise dark brown. Third antennal segment long, in frontal view 4 times as long as 2nd segment and almost reaching to epistoma; rather more slender in male than in

female. Parafacialia broad, at lunula, twice as broad as width of 3rd antennal segment and broader than this segment throughout. Parafacialia and genae bare. Genae broad; the depth below lowest eye-margin equal to twice width of 3rd antennal segment. Peristomal setae quite dense, especially posteriorly. In lateral view, vibrissal angle behind the level of profrons and epistoma concealed. Facial ridges densely setulose, to midway level of 3rd antennal segment or slightly higher. Mentum of proboscis dark brown. Palpi yellow, rather compressed, quite long-haired.

*Thorax.* Ground-colour black, the scutellum yellow on apical half or more. Mesonotum densely grey or ash-grey dusted with a conspicuous pattern of broad black undusted vittae as follows: a pair of vittae between *acr* and *dc*, clearly marked from neck to 2nd or 3rd *post dc*; a pair of spots between *prst dc* and *ph*; a pair of short vittae between anterior *post dc* and *ia*, and a pair of narrow vittae along posterior *post dc* rows. Pleura with little dust, matt. Scutellum dusted, concoloured with mesonotum but becoming thinner towards the tip which is undusted. Spiracles dark brown. All ground-setulae fine, those on mesonotum quite dense, especially long and dense in male. Setae strong. *Acr* setae not always paired. 3 *h*. 2 *ph*. 3 *ia*, the anterior one short and sometimes duplicated. 2 *sa*, both strong. *Pra* about half length of 2nd *npl*. Post-alar declivity with a tuft of setulae at middle. One propleural and 1 prostigmatal seta, each surrounded by numerous setulae but without auxiliary setae. Mesopleuron densely setulose almost all over, without a differentiated upper anterior setula. Notopleuron with 2 setae and almost entirely covered with setulae. Lower *stpl* closer to posterior than to anterior one, with some stronger setulae just in front of the two posterior setae. Hypopleuron long-haired below spiracle, and usually bare on metepisternum. Scutellum with 5 strong and moderate lateral pairs of setae and 1 strong apical pair. Disc densely setulose, several sub-lateral and subapical setae present.

*Legs.* Black. Fore femur without *av* setae, with a row of strong *pv* setae. Fore tibia usually with 2 submedian *p* setae, sometimes with only 1, and several erect *ad* setulae in apical half. Mid femur with rows of *av* and *pv* setae on basal half, that are stouter in female than in male. Mid tibia with 2-3 *p* setae. Hind femur with several fine *pv* setae in basal half, usually more hair-like in male than in female, and a complete row of *av* setae the basal ones of which are more hair-like, like the *pv* setae; *ad* row complete; 1 short *d* and 0 *pd* preapical setae. Hind tibia with a row of short *pd* setae on apical half, none exceeding tibial depth, amongst which is the short calcar; with an almost complete row of *ad* setae; 3-5 *av* but 0 *pv*; *av* apical present.

*Wings* (Text-fig. 2). Clear, veins brown. Membrane quite extensively devoid of microtrichia on basal part; discal cell for example bare on basal third and with a bare strip extending along vein 5 almost to hind cross-vein. Basicosta orange, epaulet orange to brown. Costa setulose ventrally almost to the apex of vein 2, the spine inconspicuous. Small cross-vein placed midway between the points where *sc* and vein 1 enter costa. Hind cross-vein oblique, sinuate. Squamae creamy to dirty creamy; the margins and fringes yellow, margin and fringe of the upper one sometimes rather dark outside. Halteres and knob dark brown.

*Abdomen.* Black in ground-colour. Entirely covered with light grey to ash-grey dust; without vittae, but with a conspicuous and well-developed series of shifting pruinose patches on tergite 3-5. Without striking setae; tergites quite long-haired laterally and posteriorly.

*Genitalia.* 2 ♂ dissected (Transvaal, Cape Province): sternite 5 as in Text-fig. 4; cercal plate as in *indecora* (Text-fig. 6); surstylus as in Text-fig. 7; aedeagus as in Text-fig. 3. 3 ♀ dissected (India, Cape Province, Botswana): ovipositor as in Text-figs 8, 9; 3 oval or elongate-oval spermathecae.

*Measurements.* Length of body, 8.0-9.0 mm. Length of wing, 7.5-8.5 mm.

#### MATERIAL EXAMINED.

*Muscina heterochaeta* Villeneuve, lectotype ♀, ZAMBIA: Chilanga, in house, 31.vii. 1913 (R. C. Wood) (BMNH).

SENEGAL: 1 ♂, 1 ♀, Richard-Toll, dans les nids de *Lagonosticta* (MNHN). NIGERIA:

1 ♀, south, April (BMNH); 1 ♀, Zaria, Samaru, 12.ii.1969 (*J. C. Deeming*) (IAR); 1 ♂, Samaru, m.v. light trap, 26.vi-6.vii.1970 (*P. H. Ward*) (BMNH); 1 ♂, NW State, Mokwa, near cattle ranch, m.v. light, white sheet, 14-19.vii.1970 (*P. H. Ward*) (BMNH). CAMEROUN: 1 ♀, région de Dchang, plateaux volcaniques, 1400 m, 1923 (*Gromier*) (MNHN). ZAIRE: 1 ♀, Elisabethville, 8.viii.1912 (*J. Bequaert*) (MRAC) (paralectotype of *Muscina heterochaeta* Villeneuve); 1 ♂, Zambi (*van Saceghem*) (MRAC); 1 ♀, Uelé, Angu, nid d'hirondelle (*J. Rodhain*) (MRAC); 1 ♀, Vieux-Kilo, ix. 1935 (*R. P. Thalmann*) (MRAC); 1 ♀, Leopoldville, larve sur *Passer diffusus* [= *griseus*], 1915 (*J. Rodhain*) (MRAC) (Rodhain & Bequaert, 1916). BURUNDI: 1 ♀, riv. Ruzizi, vii. 1934 (*van Saceghem*) (MRAC). SOUTH AFRICA: 2 ♂, Cape Province, Fort Beaufort, ex nest *Sigelus silens*, xi. 1948 (*J. S. Taylor*) (BMNH) (Taylor, 1949); 2 ♀, C.P., Highlands, larva collected from nest of Fiscal Shrike [*Lanius collaris*], i. 1948 (*C. J. Skead*) (BMNH); 1 ♂, 1 ♀, C.P., Highlands, ex nest *Serinus canicollis*, 8.xii.1948 (*J. S. Taylor*) (BMNH) (Taylor, 1949); 3 ♀, C.P., Highlands, ex nest *Lanius collaris*, i. 1948 (*J. S. Taylor*) (BMNH) (Taylor, 1949); 1 ♀, C.P., Colesberg, ex nest of Cape Sand Martin [*Riparia paludicola*], v. 1954 (MRAC); 2 ♂, 2 ♀, Transvaal, Pretoria, bred from larvae in nest of South African Cliff Swallow [*Petrochelidon spilodera*], 12-17.iv.1927 (*G. A. H. Bedford*) (BMNH). BOTSWANA: 1 ♀, Ghanzi, Mongalatsela, 1924 (*J. Maurice*) (BMNH). MALAWI: 1 ♀, Port Herald, iv-vi.1913 (*J. E. S. Old*) (BMNH) (Rodhain & Bequaert, 1916). ZAMBIA: 1 ♀, Mazabuka, 29.xii.1931 (*A. M. Alston*) (BMNH). TANZANIA: 1 ♂, Ujdjidi, 1918 (*J. Rodhain*) (MRAC) (Rodhain, 1919); 4 ♂, Usambara, Nguelo (MCSN) (Bezzi, 1922); 1 ♂, Usambara, Neguelo (*H. Rolle*) (BMNH) (Bezzi, 1922). UGANDA: 1 ♂, Kampala, Mulago, on exuded eucalyptus resin, 4.ix.1936 (*E. G. Gibbins*) (BMNH). INDIA: 1 ♀, Calcutta, i.vi.1914 (*E. Brunetti*) (BMNH) (Emden, 1965); 1 ♂, Toli-ganj, near Calcutta, 18.ii.1905 (*E. Brunetti*) (BMNH) (Emden, 1965); 1 ♂, Lucknow, in barracks, ii. 1905 (*A. R. Aldridge*) (BMNH) (Emden, 1965); 2 ♂, 1 ♀, 1 uneclosed cocoon, Simla Hills, Kasauli, bred from crow's nest [*Corvus* sp.], 14.vi.1933 (*C. S. S.*) (BMNH) (Emden, 1965); 2 ♀, Nilgiri Hills, Moyar Camp, 2900 feet, iv & v. 1954 (*P. S. Nathan*) (CNC); 1 ♂, 1 ♀, Coonoor (*W. S. Patton*) (MCSN) (Patton, 1920). BURMA: 2 ♀, Shwegu Res., Bhamo, ex fruit of *Pentacme suavis*, 22 & 24.v.1929 (*D. J. Atkinson*) (BMNH) (Emden, 1965). CEYLON: 4 ♀, Suduganga, on window, 12.iv.1920, 19.v.1920, 21.vi.1923 and 24.vi.1923 (*R. Senior-White*) (BMNH) (Emden, 1965). CHINA: 4 ♂, 1 ♀, Canton (*Howard*) (MCSN) (Bezzi, 1922); 1 ♀, Kam-si, 1875 (*A. David*) (MNHN) (paralectotype of *Muscina heterochaeta* Villeneuve). SUMATRA: 2 ♂, 3 ♀, Fort de Kock, 920 m, bred from swallow's nest, i & v. 1924 (*E. Jacobson*) (ZM) (Malloch, 1928).

**DISTRIBUTION.** Widespread in the Ethiopian region. In addition to the localities listed above, it has been recorded from many localities in Zaire: Bambili (Rodhain, 1914); Angou Oueré, Bagbovo, Semio, Bwamanga, Soulou, Mamor, Boun-gou Nala, Thysville (Rodhain & Bequaert, 1916); Rhodesia: Balla Balla and R. Umzing-ware (Cuthbertson, 1932); Kenya: Mombasa Island (Villeneuve, 1915).

In the Oriental region it appears to be less widespread, and in addition to the material listed above it is recorded from India: Goilkera, Chota Nagpur (Senior-



White, 1930) and Pusa district (Patel *in* Fletcher, 1920); and from [Taiwan] Formosa (Séguy, 1937, quoted in Hennig, 1941). It has been erroneously recorded from Java (e.g. Séguy, 1935), probably because the Javanese *longicornis* (Stein) was assumed to be a synonym of *heterochaeta*.

**BIOLOGY AND HOSTS.** The larva of *heterochaeta* is an external parasite of nestling birds, lying on the body-surface and piercing the skin only with the head in order to suck blood. Occasionally it will even attack dead nestlings, sucking the body fluids and even penetrating the abdomen (Patton, 1920), and it has also been found living in the host's nostrils (Ledger, 1969). The most complete accounts of the life-cycle are by Rodhain & Bequaert (1916) and Rodhain (1919) who describe and illustrate the immature stages, and describe the host-parasite relationship, egg-laying, eclosion, duration of life-cycle, etc. Cuthbertson (1935; 1939) also describes the life-cycle and immature stages, and illustrates the latter. More recent summaries are given by Zumpt (1965) and Ledger (1969).

The known hosts are the following (see also p. 366): *Aquila rapax*, *Cinnyris cupreus*, *Colius striatus*, *Corvus* sp., *Cossypha caffra*, *Dendropicos fuscescens*, *Hirundinidae* sp., *Hirundo semirufa*, *H. senegalensis senegalensis*, *H. s. monteiri*, *Hirundo* sp., *Lagonosticta* sp., *Lamprocolius chalybaeus*, *Lanius collaris*, *Motacilla capensis*, *Passer domesticus*, *P. griseus*, *Petrochelidon spilodera*, *Ploceidae* sp., *Ploceus cucullatus collaris*, *P. velatus*, *Polemaetus bellicosus*, *Riparia paludicola*, *Serinus canicollis*, *Sigelus silens*, *Sitagra monacha*, *Spermestes cucullatus* and *Sturnidae* sp.

### *Passeromyia steini* Pont

*Muscina longicornis* Stein, 1909 : 221. Lectotype ♀, JAVA (ZM), designated by Pont (1970a : 92) [examined]. [Secondary homonym of *Passeromyia longicornis* (Macquart, 1851).]

*Muscina longicornis* Stein; Meijere, 1918 : 21.

*Muscina longicornis* Stein; Stein, 1919 : 111.

*Muscina longicornis* Stein; Stein, 1920 : 68.

*Passeromyia longicornis* (Stein) Malloch, 1928 : 328 [in part].

[*Passeromyia longicornis* (Macquart); Patton, 1929 : 388. Misidentification.]

[*Passeromyia longicornis* (Macquart); ?Fuller, 1934 : 17. Probable misidentification.]

*Passeromyia longicornis* (Stein); Townsend, 1935 : 143.

*Passeromyia longicornis* (Stein); Townsend, 1937 : 63.

Larvae, Ward, 1938 : 160.

Larvae, Bryant, 1939 : 146.

Muscid larvae, Roberts, 1940 : 233, pl. 29.

*Passeromyia* new species, Hindwood, 1947 : 125-128.

[*Passeromyia longicornis* (Macquart); Hindwood, 1951a : 179. Misidentification.]

[*Passeromyia longicornis* (Macquart); Hindwood, 1951b : 126. Misidentification.]

*Passeromyia* sp., Bourke, 1957 : 207 [in part].

*Passeromyia longicornis* (Stein); Emden, 1965 : 196.

*Passeromyia longicornis* (Stein); Pont, 1968 : 173.

*Passeromyia longicornis* (Stein); Pont, 1970a : 92.

*Passeromyia steini* Pont, 1970a : 92. [Replacement name for *P. longicornis* (Stein, 1909).]

**NOTES ON SYNONYMY.** As with *longicornis* (Macquart) and *indecora*, the published records are mixed and contain many misidentifications. Outside Australia

the species has been confused with *heterochaeta*, whilst in Australia it has been confused with *longicornis* and *indecora*. Stein's (1909; 1920) material has been studied and found to be correct. Malloch's (1928) series includes both *steini* and *heterochaeta*, whilst Patton's *longicornis* (Macquart) is in fact *steini*. Bourke's (1957) material consists of both *indecora* and *steini*.

This species was first transferred to *Passeromyia* by Bezzi (1922 : 37) who synonymised it with *heterochaeta*.

**DIAGNOSIS.** *P. steini* can be recognized by the bare post-alar declivity. *P. veitchi* is the only other species with this character, but it is confined to Fiji and has the wing-membrane entirely covered with microtrichia.

In addition, the male of *steini* differs strikingly from that of the other species by having sternite 2 covered with very dense short fine setae.

**DESCRIPTION.** *Head* (Text-fig. 1). Eyes with a few short sparse hairs, or almost bare; eye-facets of uniform width. Ocellar setae moderate. *Vte* strong, weaker than *vti* and twice as long as the adjacent post-ocular setulae. Parafrontalia and upper half of parafacialia light grey to yellowish grey pruinose, tending to be greyer in male and yellower in female; lower half of parafacialia, genae and all of occipital dilation brown pruinose; occiput with a light grey pruinose band along posterior eye-margin as far as occipital dilation. Interfrontalia dark brown to dark reddish brown in ground-colour. Parafrontalia quite broad, at middle of frons a parafrontale slightly less than ( $\delta$ ) or slightly more than ( $\text{♀}$ ) width of 3rd antennal segment and one-quarter width of interfrontalia at this point. *Ori* strong and inclinate, 6-7 pairs with a few fine interstitials, on lower three-quarters of frons, the upper ones sometimes slightly proclinate; 2 reclinate pairs of *ors*; parafrontalia otherwise with numerous dense fine hairs and setulae from vertex to lunula. Interfrontalia on upper half with 1 or 2 pairs of inclinate setae, and numerous setulae and hairs covering most of interfrontal surface here. Basal 2 antennal segments reddish, more or less extensively darkened on disc; 3rd segment dark brown, narrowly reddish at base. Third antennal segment long, in frontal view about 5 times as long as 2nd segment and falling short of epistoma by about its own width. Parafacialia broad, at lunula twice as broad as width of 3rd antennal segment and broader than this segment throughout. Parafacialia and genae bare. Genae broad; the depth below lowest eye-margin equal to twice width of 3rd antennal segment. Peristomal setae quite dense, especially posteriorly. In lateral view, vibrissal angle behind the level of profrons and epistoma concealed. Facial ridges densely setulose, almost up to level of insertion of arista. Mentum of proboscis dark brown. Palpi varying from entirely orange to entirely black.

*Thorax.* Ground-colour black, including scutellum which is not pale at tip except sometimes in immature specimens. Mesonotum densely grey dusted, sometimes appearing bluish but more usually dull ash-grey, with weakly indicated darker dusted vittae between *prst dc* and *acr*, these sometimes extending a little after suture, and between *dc* and *ph* and *ia*. Pleura with little dust, matt. Scutellum dusted, concolourous with mesonotum. Spiracles dark brown. All ground-setulae black, fine, those on mesonotum quite dense. Setae strong. *Acr* not always paired. 3 *h*. 2 *ph*. 2 *ia*, the anterior one level with 2nd *post dc*. 2 *sa*, both strong. *Pra* about half length of 2nd *npl*, sometimes duplicated. Post-alar declivity bare. 1 propleural and 1 prostigmatal seta, each surrounded by numerous setulae but without auxiliary setae. Mesopleuron densely setulose almost all over, without a differentiated upper anterior setula. Notopleuron with 2 setae and almost entirely covered with setulae. Lower *stpl* closer to posterior than to anterior one, sometimes with some stronger setulae just in front of the two posterior setae. Hypopleuron long-haired below spiracle and bare on metepisternum. Scutellum with 3-5 strong and moderate lateral pairs of setae and 1 strong apical pair. Disc densely setulose, several sub-lateral and subapical setae present.

*Legs.* Black. Fore femur without *av* setae, with a row of strong *pv* setae. Fore tibia without *p* setae, but with several erect *ad* setulae in apical half. Mid femur with some strong *av* and *pv* setae on basal half, without setae on apical half. Mid tibia with 3 *p* setae, one of these rather *pv* of *p*. Hind femur with several fine *pv* setae on basal half, longer and denser in male than in female, and a complete row of *av* setae; *ad* row complete; 1 short *d* and 0 *pd* preapical setae. Hind tibia with a row of short *pd* setae on apical half, none exceeding tibial depth, amongst which is the short calcar; with an almost complete row of *ad* setae, several of which are very long in the male; 3-4 *av* but 0 *pv*; *av* apical present.

*Wings.* Clear, veins brown. Membrane quite extensively devoid of microtrichia on basal part; discal cell for example bare on basal half or rather less and with a bare strip extending along vein 5 almost to cross-vein. Basicosta orange, epaulet brown or orange. Costa setulose ventrally almost to the apex of vein 2, the spine inconspicuous. Small cross-vein placed midway between the points where *sc* and vein 1 enter costa. Hind cross-vein oblique, sinuate. Squamae whitish to creamy yellow, the fringe hairs of the upper one usually brown. Halteres brown to dark brown, knob black.

*Abdomen.* Black in ground-colour. Entirely covered with bluish dust, the hind margins of tergites 3-5 thinly so in male and this sex more rarely also with traces of a thinly dusted median vitta on tergite 3; hind margin of tergite 3 rather thinly dusted in female; without traces of shifting pruinose patches on tergites 4 and 5. Without striking setae; tergites quite long-haired laterally and posteriorly.

*Genitalia.* 2 ♂ dissected (Queensland and Western Australia): sternite 5 and cercal plate as in *indecora* (Text-figs 5, 6); surstylus and aedeagus as in *heterochaeta* (Text-figs 3, 7). 1 ♀ dissected (Canberra): ovipositor length and structure as in *heterochaeta* (Text-figs 8, 9); 3 spherical spermathecae.

*Measurements.* Length of body, 8.0-9.0 mm. Length of wing, 7.5-8.5 mm.

**VARIATION.** The colour of the palpi is rather variable in this species. In the male, nearly all the specimens seen have dark palpi with the extreme tips orange or yellow; a few have them half yellow and half dark, and a few entirely dark; none have them entirely yellow. In the female, an equal number of specimens have the palpi half yellow and half dark and entirely dark with only the extreme tips pale; a small number have them either wholly black or wholly yellow.

The Indian female is small; antennae almost wholly orange; parafrontalia and parafacialia golden and silvery pruinose, not brown.

#### MATERIAL EXAMINED.

*Muscina longicornis* Stein, lectotype ♀, JAVA: Batavia, xi. 1907 (*E. Jacobson*) (ZM).

INDIA: 1 ♀, Nilgiri Hills, Moyar Camp, iv. 1954 (*P. Nathan*) (CNC). MALAYA: 1 ♀, Kuala Lumpur, evening, 11.viii.1924 (*H. M. Pendlebury*) (BMNH). JAVA: 3 ♀, Batavia, xi. 1907 (*E. Jacobson*) (1 ZM & 2 ZMHU) (paralectotypes of *Muscina longicornis* Stein); 1 ♀, Semarang, ix-x. 1905 (*E. Jacobson*) (ZM); 1 ♀?, Soekaboemi, vi. 1926 (*E. Le Moult*) (BMNH). SUMATRA: 2 ♀, Fort de Kock, x & xi. 1913 (*E. Jacobson*) (ZM) (Stein, 1920); 1 ♂, 1 ♀, Fort de Kock, 920 m, 1924 & 1925 (*E. Jacobson*) (BMNH) (Malloch, 1928). BURU: 2 ♀, Station 4, on exudations and sap of citrus trees, 29.i.1922 (*L. J. Toxopeus*) (ZM) (Patton, 1929). NEW GUINEA: 1 ♀, western New Guinea, Star Mountains, Sibil Valley, 1245 m, Malaise-trap, 18.x-8.xi.1961 (*L. & S. Quate*) (BPBM). NEW HEBRIDES: 2 ♂, Tanna Is. (*E. Aubert de la Rüe*) (MNH). AUSTRALIA: 6 ♂, 4 ♀, Western Australia, De Grey, west of 80-Mile Beach,



29.viii.1934 (*I. M. Mackerras*) (ANIC & BMNH); 2 ♂, 2 ♀, W.A., Wagerup, 20.xii.1956 (*B. Clare*) (WAM); 1 ♀, W.A., Lansdowne Station via Derby, 8.ix.1964 (*R. Plumb*) (ANIC); 1 ♀, W.A., 34 miles E. of Cosmo Newbery Mission, 14.x.1960 (*Chinnick, McCabe & Corby*) (ANIC); 1 ♀, Northern Territory, Amadeus Basin, 1-3.viii.1962 (*P. Ranford*) (ANIC); 1 ♀, N.T., Palm Valley, 3.xi.1962 (*H. E. Anderson*) (ANIC); 2 ♀, N.T., Alice Springs, 31.x.1962 (*H. E. Anderson*) (ANIC & BMNH); 1 ♀, N.T., 9 km N. of Kulgera, 1.x.1972 (*Z. Liepa*) (ANIC); 1 ♂, 2 ♀, N.T., 9.6 km N. of Finke River, Stuart Hwy, 3.x.1972 (*Z. Liepa*) (ANIC & BMNH); 1 ♀, Queensland, Townsville, in vehicle, 16.xii.1968 (*P. Ferrar*) (ANIC); 2 ♀, Q., 28 miles W. of Kihee, 12.xi.1949 (*S. J. Paramonov*) (ANIC & BMNH); 1 ♀, Q., near Nocundra, 13.xi.1949 (*S. J. Paramonov*) (ANIC); 1 ♂, 1 ♀, Q., Warri Border Gate - Naryilco, 3.xi.1949 (*S. J. Paramonov*) (ANIC); 3 ♂, 1 ♀, Q., Naryilco - Orientos, 4.xi.1949 (*S. J. Paramonov*) (ANIC & BMNH); 1 ♀, Q., Longreach, in house, 13.i.1972 (*G. Russell*) (ANIC); 1 ♂, Q., west of Brisbane, Moggill Farm, 25 m, Malaise-trap, 27.i-1.ii.1961 (*J. L. Gressitt*) (BPBM); 3 ♀, New South Wales, Lake George, 12.xii.1950 (*K. R. Norris*) (ANIC & BMNH); 1 ♀, N.S.W., Moree, 19.xi.1917 (*W. W. Froggatt*) (ANIC); 1 ♂, N.S.W., 40 miles N. of Broken Hill, 19.xi.1949 (*S. J. Paramonov*) (ANIC); 2 ♂, N.S.W., Albury - Holbrook, 15.xii.1949 (*S. J. Paramonov*) (ANIC & BMNH); 1 ♂, N.S.W., near Bourke, 27.x.1949 (*S. J. Paramonov*) (ANIC); 1 ♂, N.S.W., Tibooburra, Cobham Lake, 17.xi.1949 (*S. J. Paramonov*) (ANIC); 2 ♂, N.S.W., Fowler's Gap, 19.xi.1949 (*S. J. Paramonov*) (ANIC & BMNH); 1 ♀, N.S.W., 8 miles N. of Peak Hill, 10-12.xii.1969 (*R. W. Matthews*) (ANIC); 3 ♀, N.S.W., Moree, Bottle Swallow nest [*Petrochelidon ariel*], 17.xii.1965 (*K. R. Norris & D. E. Havenstein*) (ANIC & BMNH); 1 ♂, N.S.W., Bogan River (SPHTM); 3 ♂, N.S.W., Gilgandra, ex nest of Fairy Martin [*Petrochelidon ariel*], iii. 1941 (*P. Bourke*) (AM); 2 ♂, N.S.W., Gilgandra, ex nest material of *Merops ornatus*, 5.i.1942 (*P. Bourke*) (AM); 2 ♂, 6 ♀, N.S.W., Lane Cove, ex nest of Kookaburra [*Dacelo gigas*], xii. 1944 (*K. Hindwood*) (AM & BMNH) (Hindwood, 1947); 1 ♀, N.S.W., Woodford, Blue Mts, 23.xi.1972 (*G. B. Fairchild*) (ANIC); 1 ♂, 3 ♀, N.S.W., 'Oakdale', Sutton, 2, 21 & 28.xi.1972 (*R. J. Kitching*) (ANIC & BMNH); 8 ♀, Australian Capital Territory, Canberra, ex trap, xi. 1930 (*M. J. Mackerras*) (ANIC & BMNH); 1 ♂, 1 ♀, A.C.T., Canberra, bred out, 12.ii.1931 (ANIC); 1 ♀, A.C.T., Canberra, 22.iv.1952 (*S. J. Paramonov*) (ANIC); 1 ♀, A.C.T., Canberra, bred out from maggots collected in bird burrows, 12.ii.1931 (*G. Hill jun.*) (ANIC); 1 ♂, A.C.T., Canberra, collected in ?parrots burrow [Psittaciidae] (*G. Hill jun.*) (ANIC); 2 ♀, A.C.T., Canberra, on windows, 4 & 10.xii.1971 (*P. Ferrar*) (ANIC); 1 ♀, A.C.T., 10 miles N.W. of Canberra, 29.xi.1950 (*K. R. Norris*) (ANIC); 1 ♀, A.C.T., Black Mt, in trap, 23.xi.1939 (ANIC); 2 ♀, Victoria, Donald (*L. C. Gotch*) (ANIC); 2 ♂, 1 ♀, V., Nth Kew, ex owl's nest [Strigiformes], 23 & 30.xii.1940 (*C. Bryant*) (AM); 14 ♂, 8 ♀, V., Cranbourne, larvae from Rosella nest [*Platycercus eximius*], em 20.xii.1939 (*N. L. Roberts*) (ANIC, SPHTM, AM & BMNH) (Roberts, 1940; Hindwood, 1947); 2 ♂, 1 ♀, V., Rye, 16.i.1973 (*E. A. Fonseca*) (BMNH); 2 ♀, South Australia, Sleaford Bay, Pt Lincoln, 27.xi.1958 (*J. Casanova*) (ANIC & BMNH); 1 ♀, S.A., 17 miles S.W. by W. of Port Augusta, 32°39' S., 137° 32' E., 28.x.1969 (*K. H. L. Key & M. S. Upton*) (ANIC); 1 ♀, S.A., Old Alton Downs, Simpson Desert, 19.ix. 1972

(*Z. Liepa*) (ANIC); 1 ♀, S.A., Mt Barr, 24 km S.S.E. of Abminga, 25.ix.1972 (*Z. Liepa*) (ANIC).

DISTRIBUTION. South India, Malaya, Sumatra, Java, Buru, west New Guinea, Australia and New Hebrides. Also recorded from Palawan Island in the Philippines (Pont, 1968).

In Australia recorded from all states except for Tasmania, and most common in the south-east. It is less abundant in collections than *indecora*.

BIOLOGY AND HOSTS. The published accounts of the life-history of *longicornis* (Macquart) refer to both *steini* and *indecora* (see Introduction, p. 347). It seems clear, however, that the larvae of *steini* live as scavengers in the nests of birds whilst those of *indecora* are subcutaneous parasites of the nestlings.

Hindwood (1947) published an account of the life-history of this species, the larvae of which he found feeding on food remains and excreta in the nest of *Dacelo gigas*. In the laboratory, larvae fed on raw meat, and Roberts (1940) reported that they devoured a dead nestling. The pupal stage lasted 17–28 days in one year (1944) and 10–12 days in the following year. Pupae were parasitized by a species of *Mormoniella* Ashmead (Pteromalidae), which oviposits in the prepupal larva, and by the Clerid beetle *Necrobia ruficollis* (Fabricius, 1775) which is usually a tertiary carrion species feeding on dried tissue, etc. Hindwood found the adults sluggish but strongly attracted to the nesting chambers of *Dacelo*. He dissected 3 gravid females, which contained 65, 52 and 9 ovarian eggs.

The known hosts are the following (see also p. 366): *Dacelo gigas*, *Gymnorhina tibicen*, *Merops ornatus*, *Platycercus eximius*, Psittaciidae sp., *Petrochelidon ariel* and Strigiformes sp.

### *Passeromyia indecora* (Walker)

(Text-figs 1, 5, 6)

*Morellia indecora* Walker, 1858 : 215. Holotype ♀, AUSTRALIA: New South Wales (BMNH) [examined].

*Ornithomusca victoria* Townsend, 1916 : 45. Holotype ♂, AUSTRALIA: Victoria (USNM) [not examined: see below]. [Synonymy by Emden, 1965 : 194].

*Morellia indecora* Walker; Stein, 1919 : 109.

Larvae, Gilbert, 1919 : 48.

Larvae, Harvey & Harvey, 1919 : 40.

[*Passeromyia longicornis* (Macquart) Bezzi, 1922 : 31, in part. Misidentification.]

[*Passeromyia longicornis* (Macquart); ?Gilbert, 1923 : 116. Misidentification.]

[*Passeromyia longicornis* (Macquart); ?Hindwood, 1930 : 131 ff. Misidentification.]

*Morellia indecora* Walker; Séguy, 1935 : 111.

*Ornithomusca victoria* Townsend; Townsend, 1935 : 143.

*Morellia indecora* Walker; Séguy, 1937 : 394.

*Ornithomusca victoria* Townsend; Townsend, 1937 : 62.

[*Passeromyia longicornis* (Macquart); Elliot, 1938 : 42. Misidentification.]

[*Passeromyia longicornis* (Macquart); Gilbert, 1939 : 512. Misidentification.]

[*Passeromyia longicornis* (Macquart); Hindwood, 1947 : 127. Misidentification.]

[*Passeromyia longicornis* (Macquart); ?Chisholm, 1952 : 401. Misidentification.]



*Passeromyia* sp., Chisholm, 1952 : 401.

[*Passeromyia longicornis* (Macquart); ?Owen, 1954 : 239. Misidentification.]

*Passeromyia* sp., Bourke, 1957 : 207, in part.

*Passeromyia indecora* (Walker) Emden, 1965 : 93, 194.

NOTES ON TYPE-MATERIAL. The holotype of *indecora* is rather dirty and damaged: the antennae, left mid leg, left hind tarsi, right fore leg and right hind leg are missing.

This is the only Australian species of the genus with the combination of yellow palpi and densely hairy eyes, both of which characters are mentioned by Townsend in his original description of *victoria*. Dr R. J. Gagné (letter of 18 June, 1970) kindly checked Townsend's type and paratype against my key and confirmed my identification of this species. He wrote that 'the two specimens are not in good condition; in fact, between the two there was only one foreleg and one of its *p* setae is broken off at the base'.

NOTES ON SYNONYMY. *P. indecora* was incorrectly synonymized with the Calliphorid *Calliphora stygia* (Fabricius) by Osten-Sacken (1882). *P. victoria* was synonymized with *longicornis* (Macquart) by Bezzi (1922) who was followed by Malloch (1925), Hardy (1937), Séguy (1937) and Zumpt (1965), but was maintained as a distinct species by Townsend (1935; 1937).

One of Bezzi's (1922) two specimens of *longicornis* (Macquart) is this species; his second specimen, which was reared and was not from Tasmania, has not been found and could be *indecora* or *steini*. Bourke's (1957) material of *Passeromyia* sp. consists of both *indecora* and *steini*.

DIAGNOSIS. *P. indecora* is the only Australian species with yellow palpi and hairy eyes, but specimens occur with dark palpi and these differ from the Tasmanian *longicornis* (Macquart) by the paler squamae and parafacialia.

DESCRIPTION. *Head*. Eyes with long dense hairs which are equal to almost half width of 3rd antennal segment; eye-facets of uniform width. Ocellar setae moderate. *Vte* strong, slightly weaker than *vii* and twice as long as the adjacent post-ocular setulae. Parafacialia yellowish grey, almost golden, pruinose, sometimes with a brown patch near lunula; parafacialia, face, genae and part of occipital dilation brown pruinose, parafacialia often silvery or golden in less mature specimens; occiput with a light grey pruinose band along posterior eye-margin from vertex down on to occipital dilation. Interfrontalia reddish brown to dark brown in ground-colour. Parafacialia quite broad, at middle of frons a parafrontale equal to (♂) or slightly broader than (♀) width of 3rd antennal segment and one-quarter width of interfrontalia at this point. *Ori* strong and inclinate, 5-7 pairs with a few fine interstitials, on lower three-quarters of frons, the upper ones becoming progressively more inclinate and proclinate; on upper one-quarter with 2 pairs of reclinate *ors*; parafrontalia otherwise with numerous dense fine hairs and setulae from vertex to lunula. Interfrontalia on upper one-half or two-thirds with 1 or 2 pairs of inclinate setae, and numerous setulae and hairs covering most of the interfrontal surface here. First and 2nd antennal segments reddish brown to brown; 3rd segment dark brown, sometimes narrowly reddish at base. Third antennal segment long, in frontal view a good 5 times as long as 2nd segment and almost reaching to epistoma. Parafacialia broad, at lunula twice as broad as width of 3rd antennal segment and broader than this segment throughout. Parafacialia and genae bare. Genae broad; the depth below lowest eye-margin equal to twice width of 3rd antennal segment. Peristomal setae quite dense, especially posteriorly. In lateral view, vibrissal angle behind the level of profrons and epistoma concealed. Facial ridges densely setulose, up to level of insertion of arista. Mentum

of proboscis dark brown. Palpi usually yellow, sometimes partly brown or only yellow at tip or wholly brown; rather compressed, long-haired.

*Thorax.* Ground-colour black, scutellum yellow at tip. Mesonotum densely grey dusted, appearing bluish, with scarcely any indication of vittae but with some lines of darker dust between *prst dc* and *acr*, and between *dc* and *ph* and *ia*. Pleura with little dust, matt. Scutellum dusted, concolourous with mesonotum but becoming thinner towards the tip which is undusted. Spiracles dark brown. All ground-setulae black, fine, those on mesonotum quite dense. Setae strong. *Acr* setae not always paired. 3 *h*. 2 *ph*. 3 *ia*, but sometimes only 2 present on each side. 2 *sa*, both strong. *Pra* slightly shorter than 2nd *npl*. Post-alar declivity with a tuft of setulae at middle. One propleural and 1 prostigmatal setae, each surrounded by numerous setulae but without auxiliary setae. Mesopleuron densely setulose almost all over, without a differentiated upper anterior setula. Notopleuron with 2 setae and almost entirely covered with setulae. Lower *stpl* closer to posterior than to anterior one, often with some stronger setulae just in front of the two posterior setae. Hypopleuron long-haired below spiracle and usually haired on metepisternum. Scutellum with 4-5 strong and moderate lateral setae and 1 strong apical pair. Disc densely setulose, several sub-lateral and subapical setae present.

*Legs.* Black. Fore femur without *av* setae, with a row of strong *pv* setae. Fore tibia usually with 2 submedian *p* setae, but sometimes only 1 present, and several erect *ad* setulae in apical half or along entire length. Mid femur with rows of *av* and *pv* setae that are longer and stronger towards base, shorter and weaker towards apex. Mid tibia with about 5 setae on the *p* surface and slightly *v* of *p*. Hind femur with several fine *pv* setae on basal half, longer in male than in female, and a complete row of *av* setae; *ad* row complete; 0-1 short *d* and 0 *pd* preapical setae. Hind tibia with a row of short *pd* setae on apical half or more, none exceeding tibial depth, amongst which is a short calcar; with an almost complete row of *ad* setae; 3-5 *av* setae, but 0 *pv*; *av* apical present.

*Wings.* Clear, veins brown. Membrane quite extensively devoid of microtrichiae on basal part; discal cell for example bare on basal half or less and with a bare strip extending along vein 5 almost to hind cross-vein. Basicosta and epaulet orange. Costa setulose ventrally almost to the apex of vein 2, the spine inconspicuous. Small cross-vein placed midway between the points where *sc* and vein 1 enter costa. Hind cross-vein oblique, sinuous. Squamae creamy, margin and fringe of upper one often partly darkened. Halteres brownish to dark brown, knob black.

*Abdomen.* Black in ground-colour. Entirely covered with bluish dust; without any vittae or pattern, but with very weak indications of shifting pruinose patches on tergites 4 and 5, and tergites 3 and 4 with dark undusted hind-margins. Without striking setae; tergites quite long-haired laterally and posteriorly.

*Genitalia.* 2 ♂ dissected (Queensland and New South Wales): sternite 5 and cercal plate as in Text-figs 5, 6; surstylus and aedeagus as in *heterochaeta* (Text-figs 3, 7). 2 ♀ dissected (Western Australia and Australian Capital Territory): ovipositor length and structure as in *heterochaeta* (Text-figs 8, 9); 3 oval spermathecae.

*Measurements.* Length of body, 7.5-8.5 mm. Length of wing, 7.0-8.0 mm.

**VARIATION.** This is rather a variable species in several respects, but the available material, which includes bred series from single nests, indicates that only one species is involved. The principal variation is found in the *ia* setae (usually 3; sometimes 2 or 2 + 3 setae; occasionally 4); the palpi (usually wholly yellow; sometimes wholly brown, or partly brown with yellow tips); *p* setae on fore tibia (usually 2; sometimes only 1 on each side); margin of upper squama (usually creamy; sometimes partly brown); parafrenal and parafacial pruinosity (silvery or slightly golden, through to brown or partially dark brown; sometimes a dark patch just before lunula); and metepisternum (usually haired; a few specimens bare).

When viewed in certain lights, the palpi of the holotype of *indecora* appear pale in apical part (all that is visible), but close study shows that the ground-colour is dark and that they have faded or become rather translucent with age.

The female from Fiji agrees well with Australian material, but the mesonotum is ash-grey dusted and the abdominal dust too tends towards the ash side of blue.

#### MATERIAL EXAMINED.

*Morellia indecora* Walker, holotype ♀, AUSTRALIA: New South Wales, no further data (BMNH).

FIJI: Viti Levu: 1 ♀, Colo-i-Suva, Malaise-trap, 3-6.iii.1963 (*C. Yoshimoto*) (BPBM).  
 AUSTRALIA: 1 ♂, Western Australia, Cranmore Park, 12.xi.1933 (*Fuller*) (ANIC); 1 ♀, W.A., Crawley, 30.x.1934 (*K. R. Norris*) (ANIC); 1 ♀, W.A., Wyndham, 10.viii.1953 (*R. Lukins*) (ANIC); 2 ♀, W.A., Perth, 29.x and 6.xi.1967 (*H. E. Paterson*) (HEP); 1 ♀, Northern Territory, 9 km N. of Kulgera, 1.x.1972 (*Z. Liepa*) (ANIC); 1 ♂, N.T., 3 km N.N.E. of Erldunda HS, Stuart Hwy, 2.x.1972 (*Z. Liepa*) (ANIC); 1 ♂, N.T., 44-45 km N.E. of Andado HS, Simpson Desert, 29.ix.1972 (*Z. Liepa*) (ANIC); 14 ♂, Queensland, near Nocundra, 10.xi.1949 (*S. J. Paramonov*) (ANIC & BMNH); 1 ♀, Q., Cairns, ex window (*J. F. Illingworth*) (BPBM); 6 ♂, 3 ♀, Q., Corella R, 19°35' S., 140°51' E., Normanton Julia Creek Road, reared from larvae ex young and nests of Fairy Martins [*Petrochelidon ariel*], 26.x.1972 (*A. L. Dyce*) (ANIC & BMNH); 55 ♂, 9 ♀, Q., Talwood, bred from pupae in nest of Welcome Swallow [*Hirundo neoxena*], 29.x.1972 (*A. L. Dyce*) (ANIC & BMNH); 3 ♂, 3 ♀, New South Wales, Marrar, as pupae in nest of Fairy Martin [*Petrochelidon ariel*], 23.xii.1959 (*A. L. Dyce*) (BMNH & ANIC); 1 ♂, 2 ♀, N.S.W., Beecroft, larvae from sparrow's nest [*Passer* sp.], em 22.xii.1939 (*N. L. Roberts*) (ANIC); 1 ♂, N.S.W., Lake George, from larvae in nest of *Petrochelidon ariel*, xii.1950 (*K. R. Norris*) (ANIC); 12 ♂, N.S.W., Lake George, from nest of swallow [Hirundinidae], xii.1950 (*Spence & Norris*) (ANIC & BMNH); 1 ♀, N.S.W., Milson Island, feeding on Bluegum Marina, 19.xii.1909 (*J. B. Cleland*) (BMNH); 1 ♀, N.S.W., Roseville, Sydney, 2.ii.1916 (MCSN) (*Bezzi*, 1922); 3 ♂, 5 ♀, N.S.W., Gilgandra, ex nest of Fairy Martin [*Petrochelidon ariel*], iii.1941 (*P. Bourke*) (AM & BMNH); 3 ♂, N.S.W., Gilgandra, ex nest of Fairy Martin [*Petrochelidon ariel*], 3.i.1942 (*P. Bourke*) (AM); 2 ♂, 1 ♀, N.S.W., National Park, larvae ix.1937, adults x.1937, RAOU 498 [*Hylacola pyrrhopygia*] (*P. A. Gilbert*) (AM) (*Gilbert*, 1939); 1 ♂, N.S.W., Waterfall, 31.viii.1924 (*P. A. Gilbert*) (AM); 1 ♀, N.S.W., Waterfall, larvae from nestling *Ptilotis* [= *Meliphaga leucotis*], 31.viii.1924 (*P. A. Gilbert*) (AM); 1 ♀, N.S.W., no locality, larvae from nestling *Gliciphila fulvifrons* [= *melanops*] (*P. A. Gilbert*) (AM); 5 ♂, 2 ♀, N.S.W., Mungindi, nest of Chestnut-tailed Thornbill [*Acanthiza uropygialis*], em 30-31.x.1937 (*A. J. Elliot*) (AM & BMNH); 1 ♂, N.S.W., Cranebrook, near Penrith, from nest of *Acanthiza lineata*, 11.x.1950 (*K. A. Hindwood*) (ANIC); 1 ♀, N.S.W., Meroo Meadow, 7.xii.1926 (*B. Bertram*) (AM); 1 ♀, N.S.W., A.M. yard from nestling sparrow [*Passer* sp.], em 19.i.1966 (*R. Lossin*) (AM); 12 ♀, N.S.W., National Park, ex larvae in lyre bird [*Menura superba*], 1.ix.1931 (*K. Hindwood*) (AM & BMNH); 5 ♀, N.S.W., National Park, ex lyre bird [*Menura superba*], 26.ix.1931 (*K. Hindwood*) (AM & BMNH); 14 ♀, N.S.W., Marley, National Park, 27.i.1930 (*K. A. Hindwood*)



(AM, MNHN & BMNH); 2 ♀, N.S.W., Wollstonecraft, gasworks area, from nest of spice finch [*Lonchura punctulata*], em 14.iv.1940 (K. A. Hindwood) (AM); 6 ♀, N.S.W., Wollstonecraft, ex nest of spice finch, em 18 & 22.iv and 1.v.1950 (K. Hindwood) (AM & BMNH); 1 ♂, N.S.W., Dee Why Swamp, from nest of *Megalurus timoriensis*, xii. 1949 (K. Hindwood) (AM); 5 ♀, N.S.W., Chatswood, from nest of Red-browed finch [*Aegintha temporalis*], 17.vi. 1950 (K. Hindwood) (AM & BMNH); 4 ♀, N.S.W., mangroves above Roseville Bridge, from vacant nest and dead body of young *Myiagra rubecula*, 3-7.ii.1940 (K. A. Hindwood) (AM) (Hindwood, 1947); 16 ♂, 16 ♀, N.S.W., Cambewarra, bred from nest of *Strepera graculina*, 18-27.xi.1940 (K. Hindwood) (AM & BMNH); 33 ♂, N.S.W., near Narrabeen Lakes, pupae in nest-lining of *Centropus phasianinus*, em 12-18.xi.1941 (K. Hindwood) (AM & BMNH); 1 ♀, N.S.W., Murrumbateman, 22.vii.1972 (D. E. Havenstein) (ANIC); 1 ♀, Australian Capital Territory, Canberra, on windows, 4.xii.1971 (P. Ferrar) (ANIC); 1 ♂, A.C.T., Black Mt, light trap, 26.i.1954 (P. Sinclair) (ANIC); 1 ♂, 3 ♀, A.C.T., 10 miles N. of Canberra, pupae in Fairy Martin nest [*Petrochelidon ariel*], xii. 1950 (K. R. Norris) (ANIC & BMNH); 1 ♂, A.C.T., Gungahlin, nestling magpie [Cracticidae], em 18.xi.1958 (R. Carrick & A. L. Dyce) (ANIC); 2 ♀, South Australia, Sleaford Bay, early xii. 1959 (J. Casanova) (ANIC); 9 ♀, no locality (presumably N.S.W.), pupae from nest of *Centropus phasianinus*, em 25-27.iii.1950 (K. Hindwood) (AM & BMNH).

DISTRIBUTION. Australia and Fiji.

In Australia recorded from all states except for Tasmania, and most abundant in the south-east.

BIOLOGY AND HOSTS. The published accounts of the life-history of *longicornis* (Macquart) probably refer to mixed series of *indecora* and *steini* (see Introduction, p. 347). It seems clear, however, that the larvae of *indecora* live as subcutaneous parasites of nestling birds, whilst those of *steini* live as scavengers in the nests.

The principal accounts are by Gilbert (1919) and Hindwood (1930), and I have tentatively referred their material to *indecora*. Eggs are laid under the wings of the nestling bird, and the young maggots disperse over the body before penetrating the skin. They feed subcutaneously on blood, and take 6 days to reach maturity. If the nestling dies, the larvae continue to feed in the carcass until ready to pupate. Pupation takes place in the nest-lining or, if the nest is not compact, beneath it, and the pupal stage lasts up to 15 days. Infestations are usually found in the autumn and winter months, and often result in the death of the host. The number of larvae per host can range from 1 to over 30 or possibly even more.

Hindwood (1947) found that puparia were parasitized by small Hymenoptera, presumably a species of *Mormoniella* Ashmead (Pteromalidae) such as he found parasitising puparia of *steini*.

The known hosts of *indecora* are the following: *Acanthiza lineata*, *A. uropygialis*, *Aegintha temporalis*, ?*Anthochaera chrysoptera*, ?*Anthus novaeseelandiae*, ?*Carduelis carduelis*, *Centropus phasianinus*, Cracticidae sp., *Gliciphila melanops*, Hirundinidae sp., *Hirundo neoxena*, *Hylacola pyrrhopygia*, *Lonchura punctulata*, *Megalurus timoriensis*, *Meliphaga leucotis*, *Menura superba*, *Myiagra rubecula*, ?*Pachycephala*

*rufiventris*, *Pardalotus* sp., *Passer* sp., *Petrochelidon ariel*, ?*Phylidomyris niger*, ?*P. novaehollandiae*, ?*Rhipidura leucophrys* and *Strepera graculina*.

***Passeromyia longicornis* (Macquart)**

*Cyrtoneura longicornis* Macquart, 1851a : 228; 1851b : 255; pl. 23, fig. 8. Holotype ♂,

AUSTRALIA: Tasmania (MNHN) [examined].

*Ornithomusca longicornis* (Macquart) Townsend, 1916 : 45.

*Cyrtoneura longicornis* Macquart; Stein, 1919 : 111.

*Passeromyia longicornis* (Macquart); Malloch, 1925 : 46.

*Passeromyia longicornis* (Macquart); Malloch, 1928 : 328.

*Ornithomusca longicornis* (Macquart); Townsend, 1935 : 143.

*Passeromyia longicornis* (Macquart); Séguy, 1937 : 383.

*Passeromyia longicornis* (Macquart); Hardy, 1937 : 28.

*Passeromyia longicornis* (Macquart); McKeown, 1944 : 234.

*Passeromyia longicornis* (Macquart); Séguy, 1946 : 126.

*Passeromyia longicornis* (Macquart); Séguy, 1950 : 351.

*Passeromyia longicornis* (Macquart); Séguy, 1955 : 136.

*Passeromyia longicornis* (Macquart); Lee, Crust & Sabrosky, 1956 : 323.

*Passeromyia longicornis* (Macquart); Hicks, 1959 : 219.

*Passeromyia longicornis* (Macquart); Zumpt, 1965 : 40-41.

*Cyrtoneura longicornis* Macquart; Emden, 1965 : 195.

*Passeromyia longicornis* (Macquart); Norris in CSIRO, 1970 : 121.

NOTE ON SYNONYMY. Since *longicornis* (Macquart) has for so long been confused with other species, virtually all the published records refer to different species. Outside Australia (Patton, 1929), records refer to *steini*. Inside Australia, since the species is restricted to Tasmania, records refer to *steini* or *indecora*; most of those that I have been able to check refer to *indecora*. Where I have been able to trace material on which the published records are based, reference is made to the misidentifications under each species. Almost all the remaining records listed above are unverified and are based upon one or several species other than *longicornis*, but in no case is it possible even to guess at what species is intended.

DIAGNOSIS. *P. longicornis* can be distinguished from the other species of *Passeromyia* by the very dark brown pruinosity on parafrontalia and parafacialia. It is confined to Tasmania.

DESCRIPTION. *Head*. Eyes with dense long hairs which are equal to almost half width of 3rd antennal segment; eye-facets of uniform width. Ocellar setae moderate. *Vte* strong, slightly weaker than *vti* and twice as long as the adjacent post-ocular setulae. Parafrontalia thinly dull brownish grey pruinose; parafacialia, face, genae and part of occipital dilation dark brown pruinose; occiput with a light grey pruinose band along posterior eye-margin from vertex down on to occipital dilation. Interfrontalia dark in ground-colour. Parafrontalia quite broad, at middle of frons a parafrontale slightly less than width of 3rd antennal segment and one-quarter width of interfrontalia at this point. *Ori* strong and inclinate, about 7 pairs with a few fine interstitials on lower three-quarters of frons, the upper ones rather more proclinate; on upper one-quarter with 2 pairs of reclinate *ors*; parafrontalia otherwise with numerous dense fine hairs and setulae from vertex to lunula. Interfrontalia on upper one-half or two-thirds with 1 or 2 or more pairs of inclinate setae, and numerous setulae and hairs covering most of interfrontal surface here. Antennae dark brown, 2nd segment reddish dorsally at tip. Third antennal segment long, in frontal view over 5 times as long as 2nd segment and

almost reaching to epistoma. Parafacialia broad, at lunula twice as broad as width of 3rd antennal segment and broader than this segment throughout. Parafacialia and genae bare. Genae broad; the depth below lowest eye-margin equal to twice width of 3rd antennal segment. Peristomal setae quite dense, especially posteriorly. In lateral view, vibrissal angle behind the level of profrons and epistoma concealed. Facial ridges densely setulose, up to level of insertion of arista. Mentum of proboscis dark brown. Palpi dark brown, rather compressed, long-haired.

*Thorax.* Ground-colour black, including scutellum which is not pale at tip. Mesonotum densely grey dusted, appearing bluish, with scarcely any indication of vittae but with some lines of darker dust between *prst acr* and *prst dc*, and between *dc* and *ph* and *ia*. Pleura with little dust, matt. Scutellum dusted, concolourous with mesonotum but becoming thinner towards the tip which is undusted. Spiracles dark brown. All ground-setulae black, fine, those on mesonotum quite dense. Setae strong. *Acr* setae not always paired. 3 *h*. 2 *ph*. 2 *ia*, a few females with the anterior one duplicated. 2 *sa*, both strong. *Pra* slightly shorter than 2nd *npl*. Post-alar declivity with a tuft of setulae at middle. One propleural and 1 prostigmatal seta, each surrounded by numerous setulae but without auxiliary setae. Mesopleuron densely setulose almost all over, without a differentiated upper anterior setula. Notopleuron with 2 setae and almost entirely covered with setulae. Lower *stpl* closer to posterior than to anterior one. Hypopleuron long-haired below spiracles; short-haired on metepisternum in type and some specimens, bare in most other specimens. Scutellum with 5 strong and moderate lateral pairs of setae and 1 strong apical pair. Disc densely setulose, several sub-lateral and subapical setae present.

*Legs.* Black. Fore femur without *av* setae, with a row of strong *pv* setae. Fore tibia with 1 submedian *p* seta, sometimes with a second one apicad of it in female, and several erect *ad* setulae in apical half. Mid femur with rows of *av* and *pv* setae that are longer and finer towards base, shorter and weaker towards apex. Mid tibia with 3 *p* setae. Hind femur with several fine *pv* setae on basal half, longer in male than in female, and a complete row of *av* setae; *ad* row complete; 1 short *d* and 0 *pd* preapical setae. Hind tibia with a row of short *pd* setae on apical half, none exceeding tibial depth, amongst which is the short calcar; with an almost complete row of *ad* setae; 3-5 *av* but 0 *pv*; *av* apical present.

*Wings.* Clear, veins brown. Membrane quite extensively devoid of microtrichia on basal part; discal cell for example bare on basal half or less and with a bare strip extending along vein 5 almost to hind cross-vein. Basicosta orange; epaulet dark brown, orange in some of the females (? immature). Costa setulose ventrally almost to the apex of vein 2, the spine inconspicuous. Small cross-vein placed midway between the points where *sc* and vein 1 enter costa. Hind cross-vein oblique, sinuate. Squamae dirty yellow, lower one smoky on outer quarter; margins and fringes dark brown. Halteres dark brown, knob black.

*Abdomen.* Black in ground-colour. Entirely covered with bluish dust; without any vittae or pattern, but with very weak indications of shifting pruinose patches on tergites 4 and 5. Without striking setae; tergites quite long-haired laterally and posteriorly.

*Genitalia.* 1 ♂ dissected (Mangalore): sternite 5 and cercal plate as in *indecora* (Text-figs 5, 6), surstylus and aedeagus as in *heterochaeta* (Text-figs 3, 7). 1 ♀ dissected (Antill Ponds): ovipositor length and structure as in *heterochaeta* (Text-figs 8, 9); 3 elongate sausage-shaped spermathecae.

*Measurements.* Length of body, 8.0-9.0 mm. Length of wing, 7.5-8.5 mm.

#### MATERIAL EXAMINED.

*Cyrtonevra longicornis* Macquart, holotype ♂, AUSTRALIA: Tasmania, no further data (MNHN).

AUSTRALIA: 1 ♂, Tasmania, Mangalore, 27.iv.1913 (*A. White*) (BMNH); 5 ♀, Tasmania, Antill Ponds, ex *Passer domesticus*, 20.iv.1959 (*R. H. Green*) (ANIC & BMNH).



DISTRIBUTION. Known only from Tasmania.

BIOLOGY AND HOSTS. Life-history unknown.

The only known host is *Passer domesticus*.

### *Passeromyia veitchi* Bezzi

*Passeromyia veitchi* Bezzi, 1928 : 183. Holotype ♀, FIJI (BMNH) [examined].

*Passeromyia veitchi* Bezzi; Séguy, 1937 : 383.

*Passeromyia veitchi* Bezzi; Zumpt, 1965 : 41.

*Passeromyia veitchi* Bezzi; Pont, 1970b : 423.

NOTE ON TYPE-MATERIAL. In the holotype, the legs are missing except for the right mid leg, and both wings are broken off and gummed on to the data label.

DIAGNOSIS. *P. veitchi* is the only species of the genus with the wing-surface entirely covered with microtrichia, without any bare patches.

It can also be recognized by its striking appearance, because of the conspicuous dark vittae on mesonotum and the thinly dusted abdominal tergites.

DESCRIPTION. *Head*. Eyes bare; eye-facets of normal width. Ocellar setae moderate. *Vte* strong, slightly weaker than *vti* and twice as long as the adjacent post-ocular setulae. Parafrontalia rather thinly brownish golden pruinose; upper part of parafacialia, face and occipital dilation brownish golden pruinose, lower part of parafacialia and genae dark brown pruinose; occiput with a light grey pruinose band along posterior eye-margin from vertex down to occipital dilation. Interfrontalia dark in ground-colour. Parafrontalia quite broad, at middle of frons a parafrontale slightly less than width of 3rd antennal segment and one-quarter width of interfrontalia at this point. *Ori* strong and inclinate, 7-8 pairs with a few fine interstitials, on lower three-quarters of frons, the upper ones rather more proclinate; on upper one-quarter with 2 reclinate pairs of *ors*; parafrontalia otherwise with numerous dense fine hairs and setulae from vertex to lunula. Interfrontalia on upper half with 1 pair of strong inclinate setae, and with a few setulae and hairs on this part of interfrontal surface. First and 2nd antennal segments reddish, rather infuscated on disc; 3rd segment dark brown, narrowly reddish at base. Third antennal segment long, in frontal view just over 4 times as long as 2nd segment and almost reaching to epistoma. Parafacialia broad, at lunula twice as broad as 3rd antennal segment and broader than this segment throughout. Parafacialia and genae bare. Genae broad; the depth below lowest eye-margin equal to twice width of 3rd antennal segment. Peristomal setae quite dense, especially posteriorly. In lateral view, vibrissal angle behind the level of pronotum and epistoma concealed. Facial ridges densely setulose almost up to level of insertion of arista. Mentum of proboscis dark brown. Palpi dark brown, rather compressed, long-haired.

*Thorax*. Ground-colour black, including scutellum which is not pale at tip. Mesonotum densely brownish grey or golden grey dusted with a conspicuous pattern of broad black undusted vittae as follows: a pair of vittae between *acr* and *dc*, clearly marked from neck to well behind suture and continuing more weakly almost to scutellum; a pair of spots between *prst dc* and *ph*, and a pair of vittae between *post dc* and *ia*. Pleura weakly brown dusted, not appearing matt. Scutellum dusted, concolourous with mesonotum, with a broad dark brown median mark that is broader at base than at apex. Spiracles dark brown. All ground-setulae black, fine, those on mesonotum quite dense. Setae strong. *Acr* setae not always paired. 3 *h*. 2 *ph*. 1 *ia*, level with 3rd *dc*. 2 *sa*, both strong. *Pra* just over half length of 2nd *npl*. Post-alar declivity bare. One propleural and 1 prostigmatal seta, each surrounded by numerous setulae but without auxiliary setae. Mesopleuron densely setulose all over, with 2 stronger setulae in upper anterior corner. Notopleuron with 2 setae and almost entirely covered with setulae.

Lower *stpl* closer to posterior than to anterior one, with some stronger setulae just in front of the two posterior setae. Hypopleuron bare below spiracle and with a few hairs on metepisternum. Scutellum with 5 strong and moderate lateral pairs of setae and 1 strong apical pair. Disc densely setulose, several sub-lateral and subapical setae present.

*Legs.* Mid femur with rows of *av* and *pv* setae on basal half, the *pv* rather stout. Mid tibia with about 4 *p* setae, 1 of which is rather *v* of *p*.

*Wings.* Clear, strikingly yellow at base, veins brown to yellowish brown. Membrane entirely covered with microtrichia, without bare patches. Basicosta orange, epaulet orange or brown. Costa setulose ventrally almost to the apex of vein 2, the spine inconspicuous. Small cross-vein placed midway between the points where *sc* and vein 1 enter costa. Hind cross-vein oblique, sinuate. Squamae yellow, the point of articulation between upper and lower ones deeper. Halteres yellow, knob orange.

*Abdomen.* Black in ground-colour. Appearing matt black in dorsal view; in posterior view with bluish dust that is thin or almost absent on the posterior part of tergite 3 and on all of tergite 4. Without striking setae; tergites quite long-haired laterally and posteriorly.

*Genitalia.* Not studied.

*Measurements.* Length of body, 8.5 mm. Length of wing, 8.0 mm.

#### MATERIAL EXAMINED.

*Passeromyia veitchi* Bezzi, holotype ♀, FIJI: Natova, 1916 (*R. Veitch*) (BMNH).

DISTRIBUTION. Known only from Fiji, from the holotype.

BIOLOGY AND HOSTS. Unknown.

#### *Cyrtoneura pruinosa* Wulp

*Cyrtoneura pruinosa* Wulp, 1880 : 176. Syntypes 3 ♀, JAVA (lost; see Pont, 1970a : 100).

*Morellia pruinosa* (Wulp) Stein, 1919 : 109.

*Morellia pruinosa* (Wulp); Séguy, 1935 : 113.

*Morellia pruinosa* (Wulp); Séguy, 1937 : 394.

*Cyrtoneura pruinosa* Wulp; Pont, 1970a : 100.

*C. pruinosa* was described from 3 females from Java, but unfortunately the types are lost (Pont, 1970a).

The species probably belongs to the genus *Passeromyia* and not to *Morellia* Robineau-Desvoidy, since the description hardly fits any of the known Indonesian *Morellia*. According to the description it has some characters of both *heterochaeta* and *steini*, and so cannot be identified specifically. It is compared with *Muscina stabulans* (Fallén) by Wulp and the thorax is stated to be ash-grey dusted, which agrees with *heterochaeta*. However, the abdomen is bluish dusted, the cheeks are brown below, and the palpi are dark, which agrees well with *steini*.

#### HOST-PARASITE LIST

The following list contains all the recorded hosts of *Passeromyia* and also includes the new hosts from material I have seen. The identity of the parasites in Australia is given only where I have seen the material or where sufficient taxonomic information is given to facilitate identification from the literature; in other cases the parasite is given with a query or left as 'sp.'



Orders, families and genera of birds are listed alphabetically. The nomenclature of the Australian birds was checked from Anonymous (1969), and the whole list has been reviewed by Dr I. C. J. Galbraith of the Zoological Museum, Tring.

Host		REGION	PARASITE
<b>COLIIFORMES</b>			
Coliidae			
<i>Colius striatus</i>	Speckled Mousebird	Africa	<i>heterochaeta</i>
<b>CORACIIFORMES</b>			
Alcedinidae			
<i>Dacelo gigas</i>	Laughing Kookaburra, Laughing Jackass	Australia	<i>steini</i>
Meropidae			
<i>Merops ornatus</i>	Rainbow Bird, Bee-Eater	Australia	<i>steini</i>
<b>CUCULIFORMES</b>			
Cuculidae			
<i>Centropus phasianinus</i>	Pheasant Coucal	Australia	<i>indecora</i>
<b>FALCONIFORMES</b>			
Accipitridae			
<i>Aquila rapax</i>	Tawny Eagle	Africa	<i>heterochaeta</i>
<i>Polemaetus bellicosus</i>	Martial Eagle	Africa	<i>heterochaeta</i>
<b>PASSERIFORMES</b>			
Corvidae			
<i>Corvus</i> sp.	'Crow'	India	<i>heterochaeta</i>
Cracticidae			
—	'Magpie'	Australia	<i>indecora</i>
<i>Gymnorhina tibicen</i>	Black-Backed Magpie	Australia	<i>steini</i>
<i>Strepera graculina</i>	Pied Currawong	Australia	<i>indecora</i>
Dicaeidae			
<i>Pardalotus</i> sp.	Pardalote	Australia	<i>indecora</i>
Estrildidae			
<i>Aegintha temporalis</i>	Red-Browed Finch	Australia	<i>indecora</i>
<i>Lonchura punctulata</i>	Spice Finch	Australia	<i>indecora</i>
Fringillidae			
<i>Carduelis carduelis</i>	Goldfinch	Australia	? <i>indecora</i>
<i>Serinus canicollis</i>	Cape Canary	Africa	<i>heterochaeta</i>
Hirundinidae			
—	'Swallows'	Australia	<i>indecora</i>
		Africa	<i>heterochaeta</i>
		Indonesia	<i>heterochaeta</i>
<i>Hirundo neoxena</i>	Welcome Swallow	Australia	<i>indecora</i>
<i>H. semirufa</i> (= <i>gordoni</i> )	Rufous-Chested Swallow	Africa	<i>heterochaeta</i>
<i>H. senegalensis monteiri</i>	Mosque Swallow	Africa	<i>heterochaeta</i>
<i>H. s. senegalensis</i>	Mosque Swallow	Africa	<i>heterochaeta</i>
<i>H.</i> sp.	—	Africa	<i>heterochaeta</i>
<i>Petrochelidon ariel</i>	Fairy Martin, Bottle Swallow	Australia	<i>indecora</i> , <i>steini</i>
<i>P. spilodera</i>	South African Cliff Swallow	Africa	<i>heterochaeta</i>
<i>Riparia paludicola</i>	African Sand Martin	Africa	<i>heterochaeta</i>
Laniidae			
<i>Lanius collaris</i>	Fiscal	Africa	<i>heterochaeta</i>
Maluridae			
<i>Acanthiza lineata</i>	Striated Thornbill	Australia	<i>indecora</i>

Host		REGION	PARASITE
<i>A. uropygialis</i>	Chestnut-Rumped Thornbill	Australia	<i>indecora</i>
<i>Hylacola pyrrhopygia</i>	Heath Wren	Australia	<i>indecora</i>
Meliphagidae			
<i>Anthochaera chrysoptera</i>	Little Wattle-Bird	Australia	? <i>indecora</i>
<i>Gliciphila melanops</i> (= <i>fulvifrons</i> )	Tawny-Crowned Honeyeater	Australia	<i>indecora</i>
<i>Manorina melanocephala</i> (= <i>Myzantha garrula</i> )	Noisy Miner	Australia	sp.
<i>Meliphaga (Ptilotis) leucotis</i>	White-Eared Honeyeater	Australia	<i>indecora</i>
<i>Phylidonyris niger</i> (= <i>Meliornis sericea</i> )	White-Chested Honeyeater	Australia	? <i>indecora</i>
<i>P.</i> (= <i>M.</i> ) <i>novaehollandiae</i>	New Holland Honeyeater, Yellow-Winged Honeyeater	Australia	? <i>indecora</i>
Menuridae			
<i>Menura superba</i> (= <i>novae-hollandiae</i> )	Superb Lyrebird	Australia	<i>indecora</i>
Monarchidae			
<i>Myiagra rubecula</i>	Leaden Flycatcher	Australia	<i>indecora</i>
Motacillidae			
<i>Anthus novaeseelandiae</i> (= <i>australis</i> )	Australian Pipit	Australia	? <i>indecora</i>
<i>Motacilla capensis</i>	Cape Wagtail	Africa	<i>heterochaeta</i>
Muscicapidae			
<i>Sigelus silens</i>	Fiscal Flycatcher	Africa	<i>heterochaeta</i>
Nectariniidae			
<i>Cinnyris</i> (= <i>Nectarinia</i> ) <i>cupreus</i>	Copper Sunbird	Africa	<i>heterochaeta</i>
Pachycephalidae			
<i>Pachycephala rufiventris</i>	Rufous Whistler	Australia	? <i>indecora</i>
Ploceidae			
Ploceid	—	Africa	<i>heterochaeta</i>
—	'Weaver-Birds'	Africa	<i>heterochaeta</i>
<i>Lagonosticta</i> sp.	—	Africa	<i>heterochaeta</i>
<i>Passer</i> sp.	Sparrow	Australia	<i>indecora</i>
<i>Passer domesticus</i>	House Sparrow	Africa	<i>heterochaeta</i>
		India	<i>heterochaeta</i>
		Tasmania	<i>longicornis</i>
<i>P. griseus</i> (= <i>diffusus</i> )	Grey-Headed Sparrow	Africa	<i>heterochaeta</i>
<i>Ploceus cucullatus collaris</i>	Black-Headed Weaver	Africa	<i>heterochaeta</i>
<i>P. velatus</i>	Southern Masked Weaver	Africa	<i>heterochaeta</i>
<i>Sitagra monacha</i>	West-African Little Weaver	Africa	<i>heterochaeta</i>
<i>Spermestes cucullatus</i>	Bronze Mannikin	Africa	<i>heterochaeta</i>
Rhipiduridae			
<i>Rhipidura leucophrys</i>	Willie Wagtail	Australia	? <i>indecora</i>
Sturnidae			
—	'Starlings'	Africa	<i>heterochaeta</i>
<i>Lamprocolius chalybaeus</i>	Blue-Eared Glossy Starling	Africa	<i>heterochaeta</i>
Silviidae			
<i>Megalurus timoriensis</i>	Tawny Grassbird	Australia	<i>indecora</i>
Turdidae			
<i>Cossypha caffra</i>	Robin-Chat	Africa	<i>heterochaeta</i>
PICIFORMES			
Piciidae			
<i>Dendropicops fuscescens</i>	Cardinal Woodpecker	Africa	<i>heterochaeta</i>

Host		REGION	PARASITE
PSITTACIFORMES			
Psittacidae			
—	'Parrots'	Australia	<i>steini</i>
<i>Platycercus eximius</i>	Eastern Rosella	Australia	<i>steini</i>
STRIGIFORMES			
—	'Owl'	Australia	<i>steini</i>

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